...ent to the Final Environmental Statement

VOLUME 1 OF 2

Proposed
Five-Year OCS
Oil & Gas Lease
Sale Schedule

January 1982 -
December 1986

Prepared by The Bureau of Land Management
United States Department of the Interior

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

NOTE TO READERS

The purpose of this Final Supplemental Environmental Impact Statement is to revise the Draft of this document which was released to the public on June 10, 1981, and has since received the benefit of testimony from several public hearings, and written comments from other Federal agencies, States and local governments, and private organizations and individuals. Meanwhile, the Department of the Interior has progressed in refining the program covered by Draft.

This document describes the latest (July 1981) proposed five-year oil and gas leasing schedule for the OCS, comparing it to the April 1981 draft proposed schedule and seven other alternatives. Like the Draft, this document will describe the impacts estimated to result from the adoption of each of these schedules, comparing them to those discussed in the Final Environmental Impact Statement (FES 80-3) Five-Year OCS Oil and Gas Lease Sale Schedule, March 1980 - February 1985.

This document references, by page number, corresponding sections in FES 80-3, the FEIS, in order to ease cross-referencing between the two documents. Only sections which have been substantially altered, or sections which describe and analyze new impacts are reproduced here. It is important with this document, as it was with the Draft Supplement, that the reader refer to, or be familiar with, material found in the Final Five-Year OCS Leasing Schedule Environmental Impact Statement. This document is not a substitute for the FEIS; rather it only supplements the original analysis, and adds additional alternatives for analysis and consideration.

UNITED STATES DEPARTMENT OF THE INTERIOR

FINAL SUPPLEMENT TO THE FINAL ENVIRONMENTAL STATEMENT

Proposed Five-Year OCS Oil and Gas Lease Sale Schedule

January 1982 - December 1986

Volume 1 of 2

Director, Bureau of Land Management

SUPPLEMENT TO THE FINAL ENVIRONMENTAL
IMPACT STATEMENT - PROPOSED FIVE-YEAR
OCS OIL AND GAS LEASE SALE SCHEDULE

JANUARY 1982 - December 1986

Responsible Agency U.S. Department of the Interior Bureau of Land Management

Abstract This supplement considers a July 1981 proposed five-year schedule extending from January 1982 to December 1986 and consisting of 42 oil and gas leasing sales in 14 of the 23 planning areas of the Outer Continental Shelf. his document supplements FEIS 80-3 which examined the current schedule and nine other alternatives.

In this document, the proposed schedule dated July 1981 is examined using two different leasing options, one offering all of the acreage within a planning area and the other offering only areas of hydrocarbon potential A Second alternative re-examines the April 1981 draft proposed schedule. A third alternative examines the current schedule with two leasing options, one offering the current pace and system of leasing, the other using the current leasing system but offering larger amounts of acreage per sale. A fourth alternative concerns two modifications of the proposed schedule in Alaska. The first modification reduces the number of sales offshore Alaska while making adjustments in the timing of other Alaska sales. This part of the alternative is further analyzed using the planning area-wide and areas of hydrocarbon potential as leasing options. The second modification covered in this alternative proposes the deletion of all Arctic Ocean OCS sales and this too is analyzed with the area-wide and areas of hydrocarbon potential options.

Estimates of the amounts of oil and gas to be discovered due to the adoption of the proposed schedule and leasing system are highly uncertain because of the lack of knowledge about industry's response. However, preliminary estimates indicate the possible recovery of around 8.3 billion barrels of oil and around 39 trillion cubic feet of gas.

The number of oil spills that might be expected is also highly speculative, but based on the above estimates, around 13 spills of over ten thousand barrels and around 29 spills larger than one thousand barrels could be expected based on historical trends during the approximately thirty-five year period needed to totally recover the 11 billion barrels of oil. Impacts to marine and coastal exosystems will occur in excess of thos described in the FEIS for the current schedule due to the larger number of sales and the increased amount of the available resources expected to be recovered. Localized impacts to marine organisms in the vicinity of offshore structures will also increase with the increase in drilling and development activity. In addition, impacts to local economies, infrastructure, land use and subsistence lifestyles (Alaska), and multiple use conflicts on the OCS are expected to occur to an uncertain degree but higher than described in the FEIS for the current program. This supplement also describes the new leasing system and explains what effects it may have on the environment.

An environmental analysis incorporating more refined planning area specific data will be prepared to consider each sale on the adopted schedule

States Where the Propsed Action is Located: The proposed schedule includes sales offshore of the following States: Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Delaware, Maryland, Virgina, North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, Texas, California, and Alaska.

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APPENDICES

Proposed Action

The proposal consists of adopting the July 1981 schedule of 42 OCS oil and gas lease sales in 14 of the 20 planning areas on the OCS, and also incorporating a new, streamlined leasing system, including offering all acreage in a planning area, at each sale. This is expected to permit the offering of up to 50 million acres or more in a single planning area rather than no more than 3 million under the present system. The proposed schedule lists six sales along the Atlantic Coast, one each in the North and Mid-Atlantic prior to their being combined into a single planning area, one in the new area called the North Atlantic, one in the South Atlantic, and two sales in the Atlantic whose planning areas will be identified at a later date. The Gulf of Mexico is split into three planning areas. Two sales are scheduled in the Gulf prior to the split, then 12 sales are listed, 4 each in the Western, Central, and Eastern areas, or one in each area each year between 1983 and 1986. Three sales are scheduled in Southern California, and two in Central and Northern California. One sale is scheduled for South Alaska covering four planning areas. Ten sales are scheduled in the Bering Sea: two in the North Aleutian Basin, three in St. George Basin, two in the Navarin Basin, and three in Norton Basin. Five sales are listed in the Arctic Ocean, one in Hope Basin, one in Barrow Arch, and three in the Diapir Field. Annual offerings on the entire OCS would increase from 10.8 million acres in 1982, to in excess of 400 million acres in 1986, thus opening large parts of the OCS to exploration and potential production (Alternative I-1, 42 sales).

Alternatives Considered Include:

An option to the proposal is presented in which the same number of sales are offered using the same schedule, and the same leasing system is employed, but instead of offering an entire planning area with each sale, only geologically favorable acreage is offered. This would reduce the acreage offered depending on the size of the geologically favorable areas, and would concentrate leasing and possible operations in those areas (Alternative I-2, 42 sales).

One alternative is the schedule of April 1981, similar in characteristics to the proposal, except that sales in some areas are not identified by planning areas, and reoffering sales are scheduled area each year (Alternative II, 42 sales).

Another alternative is based on the current schedule and it presents two leasing options. Alternative III-1 calls for no action either on the June 1980 schedule or on the present pre-sale planning process and method of leasing. This was the alternative analyzed as the proposal in the FEIS. Alternative III-2, the second option, calls for the use of the present schedule and leasing system but proposes to offer more acreage at each, sale thereby increasing the amount of acreage offered throughout the schedule but not speeding the pace of OCS activity as much as the proposal (Alternatives III-1 and III-2, 25 sales).

A final alternative (Alternative IV) takes into account the concerns of the State of Alaska and the city of Kaktovik, Alaska, and is divided into two parts to address each Government's concerns.

Alternative IV-1.a, taking into account concerns of the State of Alaska, schedules seven fewer sales in the Alaska OCS than are included in the proposal. This alternative schedules four instead of five Arctic sales, four instead of ten Bering Sea sales (no sales in the North Aleutian Shelf) and one sale in South Alaska waters. Option (a) of this alternative assumes that streamlining of the leasing system and offering entire planning areas in Alaska as well as the remainder of the OCS will take place. Option (b) (IV-1.b) assumes the same schedule as above, except that only geologically favorable acreage would be offered at each sale (Alternative IV-1.a and IV-1.b, 35 sales).

Alternative IV-2.a takes into account the concerns of the city of Kaktovik and other local Governments and native peoples along the North Slope of Alaska. The Hope Basin, Barrow Arch and Diapir Field planning areas would be removed from the schedule and no sales held in the Arctic Ocean. This option assumes the offering of all acreage in each planning area. The accompanying option, Alternative IV-2.b, assumes the same schedule and lack of Arctic Ocean sales, but with only geologically favorable acreage being offered (Alternative IV-2.a. and IV-2.b., 37 sales).

Summary of Environmental Impacts:

The most frequently raised environmental concern in relation to the proposal and all other OCS activity is the result of oil and gas operations on commercial fishing, both the industry and the fish resources sought out by the industry. Due to the placement of platforms in fishing grounds, gear loss, competition for port space, and the effects of oilspills and chronic discharges on fish and shellfish species, impacts would be highest in the North Atlantic and Gulf of Mexico, but in no case would the loss to the industry be measurable against the natural variation in the industry.

Oilspills would pose the greatest threat to endangered species throughout the OCS. Most serious would be the effects on endangered whales and other marine mammals in Arctic ice prone areas, and along their migratory routes and feeding grounds in the Bering Sea. In other OCS areas, endangered species could be subjected to short-term interference and stress during oilspill incidents, but no permanent species reductions should occur.

Within the various OCS planning areas are also special habitats or assemblages of organisms which could be adversely affected by oilspills or other oil and gas development-related activities. These include coral reefs and hard bottom communities (South Atlantic, Gulf of Mexico, California), canyon heads (North Atlantic), islands serving as discrete and prolific breeding grounds for pelagic birds and marine mammals, (offshore California, Aleutian Islands) major migration routes (Northern Aleutian Basin) and others. These unique or especially productive areas are most well defined outside of Alaska where the data base is greater. In many cases, these resources are discrete and limited enough that measures for particular lease sales can mitigate, though not eliminate, potential adverse environmental impacts to the resources involved.

Impacts to coastal organisms, and ecosystems, can be expected. Oilspills would have the greatest potential for severe impacts, resulting in mortality to individual organisms, and possibly reductions in population. Oilspills occurring in particularly sensitive areas, affecting a small and particularly

sensitive population--such as pelagic birds, or marine mammal breeding areas--could result in long-term population declines.

The placement of platforms on the OCS will contribute to conflicts with navigation, especially in high use areas such as in the North Atlantic and California. Construction of platforms in or near traditional traffic routes will increase the potential for accidents. In addition, platform placement and other oil and gas related activity could infringe upon military training and operational areas, and could increase the chance of conflict with the space program, which uses large areas of the OCS for spent missile impact areas. The South Atlantic and Eastern Gulf of Mexico planning areas would be most susceptable to such military and space related conflicts.

Air quality in the Northeast, and along the central and western coasts of the Gulf of Mexico would be adversely affected as new or expanded gas processing plants, built in areas which currently have poor air quality, began processing natural gas from fields developed as a result of the adoption of this proposed schedule. Elsewhere, new plants would not be required, or air quality controls could ameliorate impacts.

Oilspills present the greatest danger to coastal recreation activities, as a grounding oilspill usually causes a serious reduction in beach use and tourist activity. The greatest possibility for such an impact will be along the Atlantic Coast, eastern Gulf of Mexico, and southern California, all areas of particularly heavy coastal recreation activity.

Impacts to local and regional economies, infrastructure, and land use, are expected to be low to moderate. Outside of Alaska, all coastal regions adjacent to OCS areas have some degree of industrialization, and the economic bases in the urban areas are diverse. Projected levels of OCS-related activities are not expected to produce major changes or growth in economic sectors, or to regional employment or population. Depending upon the exact location of onshore facilities, some land use conflicts, and social and fiscal impacts on communities could be expected. Because of the relatively undeveloped nature of much of the coastal area of Alaska, much of the land necessary to accommodate support facilities and processing plants will come from non-industrial use, and will constitute a major local change. Likewise, the influx of oilfield workers will affect the State's economy, especially in Anchorage, where most of the workers moving permanently into the State are expected to reside. Impacts to native peoples from the increased activity is expected to be kept to a minimum with the use of isolated service and support bases. Impacts to native subsistence food sources from the effects of oilspill and other population disturbance could in turn affect native subsistence cultures, especially in the Arctic areas.

Alternatives I-2 and II: The differences between these alternatives and the proposal (I-1) would be very minor and overall, throughout the OCS, they would be expected to bring about the same types and levels of impact as Alternative I-1.

Alternative III-1: This alternative would bring about the development of the OCS at roughly half the pace of Alternative I-1. It would result in approximately 60 percent of the offshore infrastructure, 45 percent of the oilspills, and the recovery of approximately 45 percent of the resources. This

would not, of course, necessarily halve the expected impacts but it is expected that, while this alternative would result in the same types of impacts, the levels reched by this alternative would be lower than expected for Alternative I-1 for all resources.

Alternative III-2: The increased acreage offered by this alternative over Alternative III-1 would result in slightly higher levels of expected impacts, but in most cases, and in almost every planning area, the difference between the two was not considered to be great enough to be meaningful.

Alternative IV-1.a and IV-1.b: These alternatives would be exactly the same as I-1 outside fo the Alaska OCS. In that area, all impacts expected from the schedule in the North Aleutian Basin would not occur because of the lack of sales. Impacts to all resources in the Norton Basin (except those resulting from Sale 57) and St. George Basin would occur later by up to three years, as sales scheduled in those areas in I-1 are delayed in this alternative.

Alternative IV-2.a and IV-2.b: Impacts expected throughout the OCS outside of the Arctic would be the same as expected in Alternative I-1. Without sales in the three Arctic planning areas of Hope Basin, Barrow Arch, and Diapir Field, no impacts from the adoption of this alternative would occur.

I. PURPOSE AND BACKGROUND OF THE PROPOSED ACTION

A. Purpose and Need for the Proposed Action

A Five-Year Oil and Gas Leasing Schedule was prepared and approved in June 1980 in accordance with Section 18 of the OCS Lands Act, as amended. The program included the period of September 1980 to June 1985. An environmental impact statement on that 5-Year Schedule and nine alternatives was prepared, and its final version made available to the public in January 1980.

Section 18 of the OCS Lands Act, as amended, requires the preparation, annual review, periodic revision, and maintenance of a 5-year oil and gas leasing program for the U.S. Outer Continental Shelf. The required annual review of the June 1980 5-year program was begun in December 1980 and completed in February 1981. As a result of that review, the Secretary of the Interior determined that the June 1980 schedule falls short of making a proper contribution to the national energy effort and that significant changes in the five-year schedule were needed to relieve that shortfall. Much of America's untapped hydrocarbon resources are thought to lie offshore, particularly in frontier areas which have never been explored. Speeding up exploration and development by offering high quality acreage early and frequently should help reduce the Nation's dependence on foreign oil and aid it's economic recovery. These are the primary reasons for the proposed changes to the existing 5-year program.

Two important aspects of the proposed program are its emphasis on leasing in high potential areas, and studying the possible offering for leasing of all tracts with hydrocarbon potential within a planning area. Both are designed to accelerate the inventory of our domestic oil and gas resources and the earlier development and production of these resources if discoveries are made.

In terms of national energy objectives, the advantages of emphasis on leasing in high potential areas are clear. If domestic resources are to be identified and produced, leasing should occur in those areas where oil and gas are most likely to be found. Much of the Nation's remaining domestic energy supply is believed to be located on the OCS. However, the precise quantities and locations of oil and gas are unknown because the promising frontier areas have not been explored adequately. To correct this problem, the proposed schedule evaluated by this supplement adds one sale per year to the schedule in producing areas and in areas with high potential to allow sales to be held more frequently. The proposal lists sales in heretofore unexplored areas so that, through the exploration process, the presence of oil or gas in exploitable quantities can be determined. The proposal therefore lists 42 proposed sales.

The major change between this proposal and the current schedule occurs in the Alaska OCS where additional sales are being proposed. The nearly total lack of hydrocarbon resource inventory information in an area which is almost twice the size of the OCS surrounding the lower 48 States (approximately 815 million acres in Alaska as opposed to approximately 444 million in the Atlantic, Gulf of Mexico and Pacific areas combined), underscores the need to open up this area for further exploration at this time.

In addition to meeting national energy needs, the 5-Year Program must, under Section 18(a)(2) of the OCS Lands Act, as amended, be prepared and maintained

in a manner consistent with the principle that the timing and location of exploration, development, and production of oil and gas bearing physiographic regions of the OCS be based on consideration of:

(A) existing information concerning the geographical, geological, ecological characteristics of such regions;

(B) an equitable sharing of developmental benefits and environmental risks among the various regions;

(C) the location of regions with respect to, and the relative needs of regional and national energy markets;

(D) the location of regions with respect to other uses of the sea and seabed, including fisheries, navigation, existing or proposed sealanes, potential sites of deepwater ports, and other anticipated uses of the resources and space of the Outer Continental Shelf;

(E) the interest of potential oil and gas producers in the development of oil and gas resources as indicated by exploration or nomination;

(F) laws, goals, and policies of affected States which have been specifically identified by the Governors of such States as relevant matters for the Secretary's consideration;

(G) the relative environmental sensitivity and marine productivity of different areas of the Outer Continental Shelf, and

(H) relevant environmental and predictive information for different areas of the Outer Continental Shelf.

Finally, Section 18(a)(13) requires the Secretary, on the basis of the above information and to the maximum extent practicable, to select the timing and location of leasing so as to obtain a proper balance between the potential for environmental damage, the potential for the discovery of oil and gas, and for the potential for adverse impacts on the coastal zone. Those Section 18 factors bearing on environmental impacts are analyzed and discussed in this statement. However, this document is only one tool used by the Secretary in carrying out his responsibility to strike the proper balance, to the maximum extent practicable, between environmental risk, development benefits, and adverse impacts on the coastal zone as required by Section 18(a)(3).

The following is an item-by-item listing of Section 18(a)(2)(A)-(H) considerations, and the appropriate portions of the FEIS, and this document where these items are discussed.

- <u>Item (A)</u>, regarding the environmental characteristics of the regions is reflected in FEIS Section III, the "Description of the Environment," pages 93-143, and in this document in

Chapter IV.

- Item (B) which calls for equitable sharing of developmental benefits and environmental risks, is addressed in Section III.E which presents a comparison of the alternatives. Other material available to the Secretary discusses the balancing necessary to determine the equitability of distribution of developmental benefits and risks among the various OCS regions.

- Item (C), is not covered in this document.

- Item (D), in the FEIS, the location of regions with respect to other uses of the OCS is addressed in the descriptive material (Section III, subsections A.4; B.4; C.4; D.4; E.4 and F.4) and in the impact analysis of the proposal (Section IV.B.2.d. and e. and Section IV.B.3.). In this document, further discussion is found in Section V.

- Item (E), industry interest in various leasing regions is included as Appendix 2 of the FEIS and Appendix 1 of this document.

- Item (F), is not considered in this document.

  Item (G), regarding relative environmental sensitivity and marine productivity is addressed in the FEIS in a matrix on page 52, and in this document in Section IV

- Item (H), concerning relevant environmental and predictive information is addressed in the FEIS in Section IV.A.5 and in this document in Sections III, IV, and V.

B. Background of the Proposal

1. Administrative Events Leading to the Proposal

The first step in the development of the proposed lease sale schedule, was a December 31, 1980 request by the Secretary for comments and information from the Governors of affected States, Federal agencies, and the public, on the 5-Year Program approved in June 1980. Specific information regarding environmental concerns and risks, and other uses of the OCS was requested, as well as information pertaining to industry interests, location of OCS regions with respect to energy markets, and laws, goals and policies of affected States. This information was requested as part of the annual review required under Section 18(e) of the OCS Lands Act, as amended. On April 13, 1981, after considering comments and information received as a result of his request, the Secretary submitted a draft proposed schedule to the Governors of affected coastal States. The draft proposal was made available for public comment through an April 17, 1981 Federal Register notice.

The proposal to add six (6) additional sales to the program, and extend it through 1986, constitutes a substantial change to the current OCS leasing schedule. Further, this change has been determined to be a major Federal action. Consequently, in accordance with the National Environmental Policy Act of 1969, as amended, a supplement to the Final Environmental Impact Statement of the original program (FES 80-3) was undertaken to evaluate the relevant environmental consequences of the new action. A Draft Supplemental Environmental Impact Statement (DSEIS) was filed with the Environmental Protection Agency and released to the public on June 5, 1981. Public hearings on the DSEIS were held during the week of July 20, in New York, NY; Washington, D.C.; New Orleans, LA; Los Angeles, CA; and Anchorage, AK, in order to receive comments and suggestions relating to the DSEIS.

The proposed program was slightly modified as a result of comments received on the draft proposed program and on July 15 the Secretary released the schedule which is considered to be Alternative I in this document's evaluations. The new proposal was submitted to Congress on July 24, 1981.

It is anticipated that during March 1982, the Secretary will submit a tentative proposed final leasing program to the Attorney General and Governors of affected States and publish it in the Federal Register. After a 30-day public review period, the Secretary will examine any comments received, make any changes he deems necessary, and submit a proposed final program to the President and Congress on May 1982. Subsequent to the statutory 60-day review period (Section 18(d)(2) of the OCS Lands Act, as amended) the Secretary will approve the new 5-year leasing schedule. Approval is expected in July 1982.

2. Scoping

On May 1, 1981, the Bureau of Land Management announced its intention to prepare a supplemental environmental impact statement on the draft proposed schedule. This notice, published in the May 1, 1981, Federal Register (46 FR 24716), contained the original (April 1981) draft proposed five-year leasing schedule covering the period January 1982 to December 1986.

Based on comments received in response to the Notice of Intent, the major scope of analysis of the draft supplement was centered on the same six issues enumerated two years earlier for the FEIS.

1. Impact on commercial fisheries.

2. Impact on habitats and resources of special concern within leasing regions.

3. Impact on endangered species.

4. Impact on air quality.

5. Impact on social and economic factors, including infrastructure and native subsistence in Alaska.

6. Impact on planning and management for other uses of the OCS and adjacent onshore areas, including the

sanctuary program.

The alternatives analyzed in the FEIS were reviewed along with the comments received in response to the Federal Register notice, the December 1980 request for comments, and the April 1981 publications of the draft proposed schedule, and the following alternatives were decided upon for examination in the DSEIS:

1) The draft proposed five-year OCS leasing schedule consisting of 42 lease sales in 18 planning areas).

2) An alternative schedule which would be an extension of the present schedule to December 1986. (35 sales)

3) A no action alternative which consists of continuing to operate under the present schedule. (25 sales)

4) An alternative which defines California sales by planning area rather than by the entire area off the State as in the proposal. (41 sales)

5) An alternative which drops or delays certain sales in Alaska. (34 sales)

6) An alternative which divides the Gulf of Mexico planning area into three sub-regions. (42 sales)

3. Consultation

The draft supplemental environmental impact statement was released on June 5, 1981. As discussed previously, public hearings were held during the week of July 20, 1981. A total of 102 persons or groups presented testimony at these hearings. Approximately 60 written comments were received from Federal agencies, State governments, local jurisdictions, industry, environmental and public interest groups and private citizens, during the review period which ended on August 10, 1981.

Comments from State, Federal and local agencies are reproduced in Section VI, along with representative sampling of comments from public interest groups and industry. Major issues raised by these comments and in the public hearings are also included in Section VI. Some corrections and clarifications pointed out by commenters are not included in the issues summary, however, the text has been revised accordingly.

As a result of Departmental consideration of the comments received, the alternatives discussed in the draft were modified in an effort to better reflect the full range of possible alternatives, leasing systems and schedules available to the Secretary. Some alternatives from the DSEIS were combined with others, and new ones were added. The alternatives appearing in this document are as below:

A. Alternative I - The proposed action which consists of adopting the schedule of 42 OCS sales described in the July 1981 proposed schedule.

Option 1. Adopting the proposed schedule with Planning Area-wide offerings.

Option 2. Adopting the proposed schedule and offering only acreage of hydrocabron potential acreage within the defined planning areas.

B. Alternative II - The proposal outlined in the DSEIS which was the adoption of a schedule of 42 sales as defined by the April 1981 draft proposed program. This proposal only considered the option of planning area-wide sale offerings.

C. Alternative III - Continue to use the June 1980 schedule (36 sales).

Option 1. No Action: Use the June 1980 schedule and the present leasing system.

Option 2. Use the June 1980 schedule but offer larger amounts of acreage per sale.

D. Alternative IV - Change the proposed July 1981 schedule by modifying the number and timing of Alaska sales.

Part 1. Reduce the number of Alaska sales from 16 to 9, and delay sales within the schedule (35 sales).

Option a. Reduce the number of Alaska sales and employ planning area-wide offerings.

Option b. Reduce the number of Alaska sales and offer only acreage of hydrocarbon potential within each planning area.

Part 2. Delete all Arctic Ocean planning areas, eliminating all sales in Hope Basin, Barrow Arch, and Diapir Field (37 sales).

Option a. Delete Arctic sales and employ planning area-wide offerings in the remaining areas.

Option b. Delete Arctic sales offering only acreage of hydrocarbon potential within each remaining planning area.

In addition, the alternatives analyzed in the FEIS continue to remain in consideration.

4. Regulatory and Administrative Framework Department of the Interior

a. Pre-Lease Sale

(1) Administrative Steps Leading to Sale Proposals

This section has been expanded for a clearer explanation of the proposed streamlined process and can be found in Section II: Description of Streamlined OCS Pre-Sale Procedures.

(2) General Geohazards Information

A general geohazards evaluation is provided by the Minerals Management Service for inclusion in the Environmental Impact Statement that is prepared for each lease sale. The evaluation is area specific rather than tract specific. It includes all information available at the time, including exclusive contract data in areas with high potential for bottom instability, and regional analysis based on data available from government agencies and the scientific-academic community. The evaluation provides an assessment of the current state of information concerning geohazards in a given planning area.

(3) Stipulation Development

During the environmental assessment process, conditions or resources may be identified which are believed to warrant special regulation. In this event, stipulations may be developed which are proposed for attachment to one or more leases in a sale area. Once sufficient knowledge is gained of the resources, sections of the planning area may be designated in which certain stipulations may be applied, thus advising prospective lessees of the special measures which would be attached to leases within those areas. Stipulations may be developed by the BLM OCS Office staff conducting the analysis, or suggested by other Federal agencies, States or the public through the environmental statement comment process.

Recommendations for stipulations are normally first considered by the BLM OCS Office, in consultation with the regional offices of the Minerals Management Service (MMS), the U.S. Fish and Wildlife Service, and the National Park Service. This consultation process is carried out in accordance with Part 655 of the Departmental Manual which details interdepartmental coordination procedures for OCS leasing activities.

The final decisions on the adoption of stipulations, and their specific requirements, are made by the Secretary prior to issuance of the Notice of Sale.

Stipulations may be developed to address a wide variety of situations and concerns. In the past, they have most often been used to protect cultural and biological resources and to mitigate against potential geologic hazards. They may be used to restrict operations to a specific portion of a tract, when some portions are considered geologically hazardous or contain a biological resource which could be adversely affected by operations. Stipulations may allow the MMS to require that lessees conduct additional studies prior to operations on a tract or a portion of a tract, in order to demonstrate that operations may be safely conducted or may be conducted without adversely affecting a resource of

concern. Finally, they may require that operations on all or a part of the tract be conducted in a specified manner in order to protect a resource of concern.

(4) Environmental Studies Program

The Bureau of Land Management's OCS Environmental Studies Program was initiated in 1973 by the Secretary of the Interior through a commitment to perform investigations of certain environmental features in the Gulf of Mexico. The program was formalized in Section 20 of the Outer Continental Shelf Lands Act Amendment of 1978 (P.L. 95-372) which requires the Secretary to conduct a study of any area or region included in an oil and gas lease sale in order to produce and analyze information required for the prediction, assessment, and management of impacts on the human, marine and coastal environments of the OCS and coastal areas which may be affected by oil and gas development.

Environmental studies groups in each of the Bureau's four OCS offices (New York, New Orleans, Los Angeles, and Anchorage) provide the working framework for the program, with overall management, planning, and budgeting responsibility at the Washington Office, Branch of Offshore Studies.

Each OCS office, in coordination with appropriate Federal, State, local and private authorities, defines significant environmental issues associated with the lease sales within its respective jurisdiction. Issues which require further study are identified and delineated from those for which information is adequate. Studies designated to address the issues are identified and outlined in regional studies plans (RSPs) prepared annually by the OCS offices and submitted to the BLM headquarters office in Washington. The Washington Office reviews the priority rankings submitted with the RSPs and assures that the rankings reflect the importance of each study in supporting information needs for the Secretary's five-year leasing schedule. The BLM ranking criteria were developed jointly by the Bureau and the Office of Management and Budget. Ranking is based primarily on the existence or absence of legal responsibility, timing of the sale related decision requirements, applicability of study results to issues in other OCS regions, availability of information required to complete the study, and regional concern for the significant issues.

Changes in the OCS Environmental Studies Program will support area-wide or offerings of acreage with hydrocarbon potential and the streamlining process. Most studies are regional in extent rather than site specific. For example, a physical oceanography study in the Gulf of Mexico may be required to determined potentially harmful oil transport to sensitive environmental sites in the event of a major oilspill in the Gulf region. Field measurements obtained by oceanographic research ships and satellites, followed by complex computer modelling at shore facilities would be required to analyze data collected over a large portion of the Gulf of Mexico. This approach allows for considerable cost savings over other approaches that might require numerous fragmented efforts scattered about the Gulf. This same regional study methodology and its associated cost savings applies to the other OCS areas.

Some site specific studies are conducted infrequently when the locations of certain extremely sensitive sites coincide with known industry exploration and production interests. It is not cost effective to initiate numerous site specific studies in anticipation of leasing one or more small group of specific

tracts. If the tracts are not leased, study funds are depleted needlessly. By waiting until after the lease sales, required site specific studies can be more thoroughly planned and executed to provide information required for post-sale activities. In addition, lease stipulations, regulations, and OCS Operating Orders (USMMS), will be utilized to protect the environment where thorough pre-sale studies have been deferred.

Information obtained from the OCS Environmental Studies Program is utilized in the Environmental Impact Statement development process and other major pre-sale decisions, and in the numerous post-sale decisions that are necessary in the course of exploration, production, and transportation of the oil and gas to the market place. The individual study contracts require status reports to BLM at fixed intervals (monthly, quarterly, annually, etc.) or at major milestones (after major cruises, data analysis tasks, etc.), depending on the nature of the study. Each OCS office also convenes special studies workshops and information transfer meetings. Through these mechanisms, the accelerated sale schedule can go forward while vigorously supported by the most current information provided by the BLM OCS Environmental Studies Program, and by information obtained through research efforts conducted by other Federal, State, local and private groups.

b. Post Lease Sale

(1) Exploration, Development and Production Plans:

The material provided on pages 11 to 13 of the FEIS remains correct and up to date as written except for the addition of the following material:

Detailed, technical and site-specific geohazards data is gathered as part of the information which must be furnished prior to approval of any exploration and development plan. A detailed geohazards survey carried out by the operator over the expected site of operations is provided to the Minerals Management Service for evaluation. At this time, it will be determined if the operation can be safely carried out at the proposed site. A discovery of geohazards at a particular location may result in a requirement that an operator relocate his proposed drilling site. Should geohazards make the entire lease block unsuitable, special permits may be issued to drill directionally from outside the lease. In the extreme case, where the Secretary determines that a lease cannot be safely developed he can cancel the lease in which case the lessee would be entitled to compensation in accordance with the provisions of 43 U.S.C. 1334(a) and 1351(h).

In accordance with Section 21(b) of the OCSLA, all new drilling and production operations, and wherever practicable, existing operations, must use the best available and safest technologies (BAST) which the Secretary determines to be economically feasible. This requirement is applicable to equipment which, if it failed, would have a significant effect on safety, health, or the environment, unless benefits clearly do not justify the costs. Section 5(e) of the OCSLA extends the standard of BAST to pipelines. Also, the Platform Verification Program was developed within the context of BAST. Provisions for the use of BAST on the OCS appear in OCS regulations in 30 CFR 250 and in OCS Operating Orders Nos. 2, 5, 6, 7, and 8. The program is explained in a 1980 publication available from the Office of the Deputy Division Chief for Offshore Minerals Regulations, USGS, Mail Stop 640, Reston, Virginia 22092.

NOTE: The remaining material provided in the FEIS on pages 7 to 18 on the regulatory and administrative framework of the Department of the Interior is unchanged.

5. Regulatory and Administrative -Other Federal Agencies

Material in this section is unchanged from that provided in the FEIS on pages 18 to 22.

6. Interrelationship with OtherProjects and Proposals

Except for the updated material presented here, the information provided in the FEIS on pages 22 to 26 remains correct.

a. Coastal Zone Management

The Coastal Zone Management Act, 16 U.S.C. 451-64, as amended, provides funds to States for the development (Section 305) and implementation (Section 306) of coastal management programs. Section 305 monies were discontinued in 1979, as originally planned. Implementation funds are included in NOAA's 1982 budget submission. The Coastal Energy Impact Program (CEIP) was created in 1976 as Section 308 of the Act. Funds (grants, loans) are available through this program through Fiscal Year 1982. It is anticipated that the program will then be terminated.

The following is an update by region of the changes in status of the coastal zone management plans of the various affected States, since publications of the FEIS.

North Atlantic

The States with approved Coastal Zone Management Programs in the North Atlantic region are: Maine, Massachusetts, Rhode Island, Connecticut, New Jersey, Pennsylvania, Delaware, and Maryland. The information presented on p. 302 and 304 of the FEIS on the programs for Maine, Massachusetts, Rhode Island, and Delaware remains the same. New Jersey's is updated to note that the entire State is now approved, whereas only the Bay and Ocean shore segment was at the time of the FEIS. The information on Maryland's program is modified as given below. Information on Connecticut's and Pennsylvania's programs is also provided below.

The location of oil, natural gas, and OCS-related facilities in Maryland's coastal counties is regulated by the Coastal Facilities Review Act and is administered by the Tidewater Administration in conjunction with other State agencies and local units of governments. Facilities covered under this act include natural gas facilities, pipelines, intermediate oil production terminals or refineries, oil and gas storage facilities, operation bases, and fabrication yards. These facilities must receive certification from the Maryland Department of Natural Resources before construction may begin. The State's attitude toward OCS development is that Maryland supports the Federal leasing initiative, while seeking safeguards to ensure that pollution of its coast is prevented, and that onshore support operations neither disrupt local communities nor disregard State plans, policies and programs. Maryland seeks involvement in the administrative of OCS lands to ensure that the safest, cleanest technologies are always employed on the Atlantic OCS.

The State of Connecticut recognizes the importance of OCS development in the Georges Bank area and feels that these resources should be "developed in an orderly manner consistent with national energy and environmental policies." Direct impacts to the State are not likely due to the distance separating Connecticut from the areas of OCS activity and insufficient deepwater access to the coast. Connecticut may experience some indirect impacts, however, due to the increased production in the industrial sector. Ancillary industries, such as tool and machinery manufacturing, diving services, and other support oriented business could be attracted to the State as a result of leasing on Georges Bank.

Pennsylvania's program is supportive of the development of OCS oil and gas resources, "provided the necessary environmental safeguards are enforced through regulation by the appropriate Federal and State agencies to ensure that the integrity of the adjacent fish and wildlife habitat is not irreparably damaged due to drilling and other development activities." (Policy VIII-4, Pennsylvania Coastal Zone Management Program, August 1980). The Program notes, however, that it is highly unlikely that much onshore development will occur in Pennsylvania as a result of OCS activities, with the possible exception of existing Delaware Valley industries which could provide ancillary industry support.

South Atlantic

In the South Atlantic region, both North and South Carolina's programs have been approved. Information on these appears on p. 305 and 306 of the FEIS.

Florida's Coastal Zone Management Program received approval in September 1981. The Florida Outer Continental Shelf Advisory Group, which is administered through the Governor's Office, is composed of State agency representatives and representatives of the petroleum and industry and environmental organizations and a local government representative. The Florida Coastal Management Program will support this committee in its efforts to strengthen State decisionmaking capability and will provide a coordinated State-local approach to OCS related activities. The Coastal Management Program will assist in refining development of Regional Impact guidelines for OCS related facilities, and in exploring the potential role of the Industrial Siting Act as it applies to oil and gas facilities.

Gulf of Mexico

Of the five Gulf of Mexico States, all except Texas now have approved CZM plans. Louisiana and Mississippi's plans were approved in 1980, Florida's in October 1981. Texas has formally dropped out of the program but has had its own CZM program for a number of years.

California

As of July 1, 1981, 15 complete local coastal programs and all four Port Master Plans have been certified. Of these, three local jurisdiction and three ports have assumed permit issuing responsibilities. Sixteen jurisdictions have completed the land use portion of their local coastal program. The remaining 36 are in various stages in completion.

Oregon and Washington

Oregon and Washington both have approved Coastal Management Plans and local mechanisms for plan implementation.

Alaska

The Alaska Legislature passed in 1977 the Alaska Coastal Management Act, which established that a coastal resource planning program be undertaken for Alaska's coastal zone.

The State of Alaska received approval of its coastal zone management plan in June 1979. Since that time, organized coastal zone governments have developed their own coastal management plans (CMP) and the unorganized areas of the State have been forming coastal resource areas (CRSA), also for the purpose of coastal planning.

To date, several local plans from organized areas have been approved by the Alaska Coastal Policy Council. Anchorage's CMP has officially been adopted by the Commerce Department as a part of the Alaskan Coastal Management Program

b. Marine Sanctuaries

Under title III of the Marine Protection, Research and Sanctuaries Act of 1972, the Department of Commerce is authorized to designate as marine sanctuaries, those areas which are determined necessary for the purpose of preserving or restoring such areas for their conservation, recreational, ecological or esthetic value. Six National Marine Sanctuaries have been designated and are listed below. Regulations applying to each of these sanctuaries have been developed and implemented. The specific regulations pertaining to oil and gas activity in the two California sanctuaries were withdrawn to allow for an analysis of the effects of these activities on the protected resources. As of this writing, the analysis conducted by NOAA, was not available nor regulations implemented.

Existing National Marine Sanctuaries

- USS Monitor, North Carolina
- Key Largo, Florida
- Looe Key, Florida
- Gray's Reef, Georgia
- Channel Islands, CA
- Point Reyes/Farallon Islands, CA

c. Navigation

Port Access Routes are discussed in the FEIS on page 24 and Section IV.B.4. Additional information on Port Access Routes follows.

The term Port Access Routes covers three navigation categories: Traffic Separation Schemes (TSS), Safety Fairways, and Precautionary Areas. Regional Coast Guard Districts are responsible for these designations. No fixed structures are permitted within sea lanes or their buffer zones. Each sea lane is, in most cases, one mile wide and is bordered on both sides by 50 yard wide buffer zones. Agencies responsible for uses of the sea in these areas must keep one another appraised of all proposed actions.

North Atlantic

Traffic Separation Schemes have been established for the approaches to Boston and Portland Harbors, Narragansett and Buzzards Bays, New York Harbor and Delaware Bay. Under the authority of the Ports and Waterways Safety Act, the First Coast Guard District has studied the need for Port Access Routes for four areas. They are: 1) Northeast coast of Maine; 2) Searsport, Bucksport and Portland, Maine, and Portsmouth, New Hampshire; 3) Boston, Massachusetts; and 4) Fall River and New Bedford, Massachusetts, and Providence, Rhode Island. The preliminary conclusions for the Boston approaches study are that the existing Traffic Separation Scheme is adequate for the traditional trade routes and amounts of traffic to and from port of Boston, and that a "precautionary area" may be needed in the area of intersection between the Boston Harbor Traffic Lanes and the Nantucket to Ambrose Traffic Lanes. Preliminary results of the other study areas are not yet available. The Third Coast Guard District has studied the need for additional Port Access Routes for New York Harbor, Long Island Sound and Delaware Bay. Their draft recommendations are that additional port access routes are not necessary at this time. The Fifth Coast Guard District has studied the need for the Port Access Routes for the Delmarva Peninsula. The preliminary findings were that there is no need to impose new ship routing measures at this time in these area. These areas will be restudied when economically recoverable oil and gas is being developed or there is a significant increase in exploratory activity.

South Atlantic

Other than for the approaches to Chesapeake Bay, there are no established Traffic Separation Schemes or fairways in the South Atlantic planning area. Under the authority of the Ports and Waterways Safety Act, the approaches to South Atlantic ports have been studied by the Fifth and Seventh Coast Guard District. Their preliminary findings are that new vessel routing measures are unnecessary at this time, but there is a possibility of new measures should there be a significant increase in OCS activity.

California

A Traffic Separation Scheme has been established offshore northern California and one is proposed, and reportedly well used, offshore central and northern California. Extensions of the southern California TSS have been proposed by the Eleventh Coast Guard District: west beyond Point Conception and north-south outside the Sale #53 Santa Maria tracts. There is a designated Safety Fairway into Port Hueneme and Precautionary Areas outside San Francisco Bay and Los Angeles - Long Beach Harbors.

Alaska

A TSS was established in 1975 outside Port of Valdez in conjunction with the completion of the Trans-Alaska Pipeline. The system was designed to lessen the probability of tanker casualties with resulting spills in Prince William Sound from tankers leaving the pipeline terminal for the west coast of the lower 48.

7. Trends in Other Energy Sources

This section is now included as Appendix 5.

8. Availability of Information

Information provided on pages 315 to 321 of the FEIS is updated by a description of ongoing studies in each OCS field office. Highlights of these studies are listed below by region. In addition, Appendix 10 lists all completed and ongoing studies by OCS regions.

Alaska OCS Office

The Bureau of Land Management (BLM) and the National Oceanic and Atmospheric Administration (NOAA) have entered into a formal agreement to conduct a program of environmental research for Alaskan Outer Continental Shelf areas identified by the BLM for potential oil and gas development. This program is called the Outer Continental Shelf Environmental Assessment Program (OCSEAP).

Recently regional and mesoscale environmental studies in the Gulf of Alaska were concluded. In addition, geological studies, including those based on seismic and volcanic monitoring and on regional surveys to determine sediment geotechnical properties, were completed.

Detailed descriptions of OCSEAP accomplishments and activities in 1981 are found in the "Annual Program Report, Outer Continental Shelf Environmental Assessment Report." It is dated November 9, 1981, and is available in Washington, D.C. and the Alaska Offices of NOAA and BLM.

Pacific OCS Office

Marine Mammal and seabird studies in central and northern California have included high altitude flights conducted on a monthly basis as part of the environmental assessment of the waters of central and northern California. Sightings revealed that the Northern Fur Sea *Callorpinus ursinus* occurs no closer than 70 nautical miles from the nearest potential leasing area in central California.

Four meteorological buoys (West Coast OCS Meteorological Buoy Monitoring Network) have been placed on the Pacific coast off central and northern California. These buoys have generated important wind data, information which will be used in both oil spill trajectory modeling and air quality modeling. Four more buoys will be in place in FY 1982 to complement the existing buoys.

The southern California offshore air quality model validation study was designed to validate and/or modify screening models commonly used to predict onshore air quality impacts from OCS emission sources. The air emissions likely to result from the various phases of proposed development, their potential impacts on onshore receptor areas, and mitigating measures and strategies available to minimize perceived impacts have been analyzed for lease Sale No. 68. Both field experiments and computer modeling analysis were included to give a better understanding of dispersion over water and at the land/sea interface.

The U.S. Fish and Wildlife Service has completed a survey (jointly funded by BLM and FWS) of seabird nesting and seasonal use of selected sites from Point

Conception north to the California/Oregon border. The information has been mapped for this region displaying the distribution, species composition and abundance of seabirds. In addition, seasonal seabird use of coastal rocks, stacks, and headlands has been documented.

Completion of the inventory and evaluation of California's Coastal recreation and aesthetic resources now allows for a more objective means of ranking the value of coastal resources.

New York OCS Office

With the transfer of South Atlantic studies from the New Orleans Office during FY 1981, the New York Office now has responsibility for all studies in the Atlantic planning areas. The general trend for Atlantic studies is to initiate new investigations in deeper water slope and rise regions while striving to complete synthesis and interpretation of the considerable data generated by past and ongoing field studies in coastal and shelf regions.

Canyon biological and physical processes studies will be expanded in FY 1982 and continued into FY 1983. As one step for the planning of deepwater programs, a synthesis study of Atlantic slope and rise literature will begin in FY 1982. Efforts to complete syntheses of physical oceanographic data in both the North and South Atlantic will be performed in FY 1982. Studies on marine mammal distributions and migratory behavior in the North Atlantic should be completed in FY 1982 and also final reports submitted on effects of oil and effects of noise on marine mammals. In the South Atlantic, characterization of live-bottom communities is nearing completion while a study on North Carolina fishery resources has started.

Other major study efforts include benthic monitoring studies on Georges Bank, initiated in FY 1982 with continued field investigations through at least FY 1983, and modeling studies of circulation and transport dynamics in the South Atlantic and oil spill induced fisheries loss in the North Atlantic. A study on the economic impact of oil and gas transportation modes in the southern part of the North Atlantic will begin in FY 1982.

New Orleans OCS Office

In the Gulf of Mexico, the main thrust of study activity will be in deeper shelf and slope waters and in the area of the Southwest Florida Shelf. A major, three year physical oceanography effort will begin in FY 82. The objective is to define the circulation regime in the Gulf and the loop current system that sometimes influences the shelf waters.

The series of ecosystem studies initiated on the Southwest Florida Shelf (FY 80) will continue. Several previously uninvestigated habitats have been discovered. In addition, the studies will include more sites closer to the coast.

The Topographic Features Studies (including the Flower Gardens) have ended. major synthesis effort has begun that will be complete by FY 83. A major regional ecosystem study will be initiated during FY 83 in the area of the Mississippi Delta, off Louisiana, Mississippi and Alabama. This study will include synthesis of available information and some field studies to develop a

good conceptual understanding of the processes controlling the area, the circulation of the area, the distribution of biotic communities through the area. A long-term fates and effect program to study impacts of OCS development in a historically developed area may be initiated in this same area beginning in FY 84.

Another major ecosystem study will be initiated during FY 83, to obtain regional reconaissance information for the outer shelf and upper slope, roughly from the head of DeSoto Canyon to west of Tampa Bay, Florida. This study will focus on seafloor structures and benthic communities.

Other studies presently planned include additional seafloor mapping of structures and communities, socioeconomic monitoring of development (should it occur) in Florida, analysis of geologic/geophysical information to determine need for cultural resource stipulations throughout broad aras of the Gulf, and studies of the beneficial impacts of production platforms on the recreational or commercial fishing industries.

NOTE: Other subsections in Chapter I of the Five-Year FSEIS (January 1980) remain as described in that document.

II. DESCRIPTION OF STREAMLINED OCS SALE PROCEDURES

A. Steps in the Leasing Process

The timing of pre-sale activities used in streamlining under the proposed schedule differ from those that have been used in the past Figure II-1). There are two basic types of changes. The first type is the telescoping of procedural steps. An example of this is the issuance of the Final EIS and Proposed Notice of Sale in the same month. The second type involves changes in the planning activities themselves. An example of this is the areawide approach to lease offerings based on geologically favorable acreage rather than the offering of specific tracts.

Both types of changes are explained in the following discussion of the eleven steps in the streamlined leasing process. It is important to note that all opportunities for public participation in the current process are retained and all phases of environmental impact analysis will still be carried out.

1. Pre-Call Activities

This first step includes all activities that take place prior to the Call for Information step. In the streamlined process pre-call activities begin with the receipt by BLM of the geology report prepared by the Geological Survey. This will occur approximately twelve months before the Call for Information (Figure II-1). The report will be for the entire planning area and will include an estimate of recoverable oil and gas in the planning areas, the location of areas of hydrocarbon potential, and the environmental geology of the area, including a regional characterization of geologic hazards. The regional geohazard characterization will focus on areas of hydrocarbon potential and on areas with the highest potential for geohazards. Following the receipt of this report, the environmental analysis will begin. The analysis will be based on information received from the Geological Survey, the Minerals Management Service (MMS), from the Environmental Studies Program, from information supplied by other agencies and groups, and through special modeling efforts.

Approximately eight months before the Call for Information, BLM will receive an exploration and development report from the MMS. This report will include information on the types of activity, along with their magnitude and timing, which might occur should the expected amounts of oil and gas resources in the planning area be developed. With the receipt of this report, any necessary modeling studies can begin. Examples of modeling which might be started at this point include socioeconomic, oilspill, and air quality models.

Under the current process, some of these reports are not received until 60 days after the final tract selection. The early submissions of data and the area-wide offering concept under the streamlined process allow preparation of the EIS to be initiated about 22 months earlier than before.

Figure II-1

COMPARISON OF THE EIS PROCESS

MONTH		STREAMLINED		CURRENT
-12	•	RESOURCE REPORTS & GEOLOGY REPORT		
-11	•	BEGIN EIS		
-10		SCOPING		
-9				
-8		EXPLORATION & DEVELOPMENT REPORT (E&D)		
-7		SOCIOECONOMIC & OIL SPILL MODELING		
-6				
-5		IMPACT SECTION OF EIS		
-4				
-3				
-2				RESOURCE REPORTS
-1				
1	C	CALL FOR INFORMATION	C	CALL FOR NOMNATION
2	D	INFORMATION DUE		
3		ALTERNATIVES DEFINED		
4	A	AREA SELECTION	D	NOMINATIONS DUE
5		E & D REPORT FOR ALTERNATIVES		
6		IMPACTS OF ALTERNATIVES		
7				
8			T	TRACT SELECTION
9				SCOPING
10				ALTERNATIVES DEFINED
11				RESOURCE & INFRASTRUCTURE REPORT
12	E	RELEASE DRAFT EIS		SOCIOECONOMIC & OIL SPILL MODELING
13				
14	H	PUBLIC HEARINGS		
15				
16				
17	F	FINAL EIS/PROP. N.S.		
18				
19				
20		FINAL SALE NOTICE		
21		SALE		
22				
23				
24				
25				
26			E	RELEASE DRAFT EIS
27				
28				
29				
30			H	PUBLIC HEARING
31				
32				
33				
34			F	RELEASE FINAL
35				
36				PROPOSED NOTICE OF SALE
37				
38				
39				
40				FINAL SALE NOTICE
41				SALE
42				
43				
44				

Some time during the 12 month period between the receipt of the geology report and the Call for Information, the BLM will meet with other Federal agencies, State and local governments, and others to gather information and to determine the scope of the environmental impact statement. This is called the scoping process. Such meetings will identify individual concerns and aid in the formulation of possible alternatives to the proposed action. Under the current process, most of such scoping meetings take place after the tract selection.

2. Call for Information

The Call for Nominations has been replaced by a Call for Information. The Call for Information will request information on an entire planning area. It is implicit that this does not include those areas excluded from leasing by statute, or as determined necessary by the Secretary of the Interior. This is the first reduction in the size of the planning area. The Call for Information will be published in the Federal Register. In addition, the public will be notified through the print and broadcast media. Areas of geologic potential within the planning area will be described in the Call.

Industry will be specifically asked to outline broad areas within the planning area which they believe to have hydrocarbon potential and which they may be interested in leasing. All interested parties would be requested to comment on possible environmental effects and use conflicts. Although the information submitted to BLM will be broader than what is submitted under the current process, it is expected that it will be useful in focusing the NEPA document analysis on areas most likely to be developed and areas of greatest concern.

3. Area Identification

The information received from the Call for Information along with that received from other sources, such as from the scoping process, is used to decide what areas, if any, should be deleted from further consideration at this point and also what are reasonable alternatives to the proposal. BLM will also use the responses from potential bidders to identify the favorable geologic areas, taking into account the collective judgement of the oil and gas industry, the Mineral's Management Service and the U.S. Geological Survey.

The Area Identification step is a formal announcement of that area on which the EIS will focus its analysis and is to be considered for leasing, giving consideration to information and comments received in the steps described above. At this point, the public will become aware of those areas that have been excluded from further consideration. This step is essentially the second refinment of the proposal that will be further considered in the EIS and decision process and is comparable to the tract selection step under the current process.

4. NEPA Document Preparation

For the first area-wide offering in a planning area, an environmental impact statement (EIS) will be prepared to assess the effects of oil and gas activities that might result from this offering and to examine the cumulative effects of development of the total potential oil and gas resources in the planning area. The NEPA document prepared for the second offering in a planning area will update the EIS that was prepared for the first offering with information that has become available since the first document was written. NEPA documents for the same planning area will be determined and prepared on a case-by-case basis following scoping activities related to later offerings.

The draft EIS will be filed with EPA approximately eleven months after the Call for Information. It will be the result of information gathering and analysis which has taken place during the previous two year period. From a comparable step in the current process, it takes 26 months to prepare a DEIS. There is no shortening of the environmental assessment process as required by NEPA and other environmental legislation under the streamline process. Environmental impact statements and other NEPA documents prepared using this streamlined process will treat cumulative impacts - i.e. They will be based on probable resources which may be leased as a result of the sale in question, and the impacts associated with development of those resources; and they will consider the impacts of the development of all the oil and gas resources in the planning area and where appropriate other activities of relevance, such as major sewage outfalls, offshore ports, etc. They will, as in the past, employ modeling techniques where necessary to aid in the analysis of probable impacts. The assessment, including modeling efforts, will treat groups of tracts or areas rather than each individual tract. This approach is reasonable given that most resources likely to be impacted are not confined to specific tracts - e.g. endangered species and fish spawning areas.

The environmental impact statement will analyze alternatives developed through the scoping process. Alternatives may also be developed proposing the deletion of specific tracts or groups of tracts to protect environmental resources or avoid use conflicts or for other major reasons. In addition there will be the standard alternatives for delay and no-action.

5. Stipulations

Based on information received from pre-Call activities, the Call for Information, scoping activities, and the analysis performed in developing the DEIS, proposed stipulations to protect sensitive resources or special use areas will be developed. Stipulation development will proceed as it has in the past. For example the Call for Information will provide an opportunity, as the Call for Nominations and Comments has in the past, for interested parties to delineate areas of concern where specific stipulations should be imposed. These areas will then be further analyzed and stipulations proposed, as appropriate, during the environmental assessment process. While planning areas will be larger than areas normally included in a Call for Nominations and Comments, current and past Call areas have nonetheless been very broad. Therefore, the

scope and level of information available for initial identification of areas or tracts possibly requiring stipulations should be similar. Because the area proposed to be offered will be identified in advance, analysis may earlier for such areas. Finally, stipulations frequently cover potential problems that can also be regulated by MMS operating orders. In these cases, the stipulations serve as early or added notice to lessees.

6. Public Hearings

Public hearings will be generally held within 45 days after release of the DEIS. These hearings will be held to the extent possible in areas which would be most directly affected by the proposal. The hearings are for the purpose of receiving comments on the DEIS from all interested parties. Written comments on the DEIS will also be solicited and receive equal consideration with those presented at the hearings. The need for and desirability of holding hearings on second and future generation NEPA documentation of a planning area will be determined on a case-by-case basis at the time the document is prepared.

7. Issuance of FEIS and Proposed Notice of Sale

Following the review and analysis of comments received on the DEIS, a Final Environmental Impact Statement (FEIS) will be prepared and made available to the public. This will occur approximately seventeen months after the Call for Information. Also, in the same month the Proposed Notice of Sale (PNS) will be issued. The Secretary's decision on the PNS is facilitated by a Secretarial Issue Document (SID) prepared by BLM. It will not include those areas excluded by statute or for national security reasons or those areas where the Secretary determines, based on analysis in the EIS and other considerations, that potential losses to other values or uses cannot be adequately mitigated and outweigh the potential benefits of oil and gas activities. This is the third occasion where environmentally sensitive areas or areas presenting conflicts may be deleted from the proposed sale area.

The streamlined process saves sixty days by issuing the FEIS and Proposed Notice of Sale at the same time. Under the current process, the Proposed Notice of Sale is issued sixty days after the FEIS is issued.

8. Governor's Comments and Department of Energy Review

Under Section 19 of the OCS Lands Act, as amended, the Governor of an affected State, having received notification of the leasing proposal, has sixty days to comment on the size, timing, and location of the proposed lease sale. Under streamlining the proposal was also to be reviewed during this period by the Department of Energy to ensure consistency with national energy goals. Because of the repeal of DOE authority in P.L. 97-100, however, DOE review will be eliminated.

9. Final Notice of Sale

A final notice of sale will be published in the Federal Register and will offer for lease the tracts described in the proposed notice except for those tracts, if any, excluded by the Secretary based on recommendations of the Governor or of an executive of an affected local government, if the Secretary determines that these recommendations "provide for a reasonable balance between the national interest and the well being of citizens of the affected State," (Section 19(c) of the OCSLAA), or on the basis of other information received after publication of the proposed notice of sale. This is the fourth occasion at which environmentally sensitive tracts or areas where oil and gas activities conflict with other uses may be excluded from the sale area.

10. Sale

Approximately thirty days after the Final Sale Notice, a sale will be held and bids will be received on those tracts offered. Although the offerings may be larger than in the past, acreage leased per sale is not expected to increase substantially. However, a larger selection of tracts will be available to prospective bidders facilitating improved exploration strategies.

11. Bid Acceptance

During a period of approximately three months following a sale, the bids will be evaluated by the Department and leases issued on a case-by-case basis where the Department determines that the high bidder has offered at least fair market value. It is probable that many leases can be issued shortly after the sale, but BLM is amending its regulations to allow up to 120 days to award leases, if necessary. The Department's evaluation of tract values will not be done until after the sale, to avoid the inefficiency of evaluating tracts which do not receive bids. Also, only a portion of the tracts which receive bids, rather than all such tracts will be evaluated.

B. Principal Differences Between the Current Procedures and Streamlined Procedures

1. Early Submission of Data to BLM

For all practical purposes, BLM can not start preparation of an EIS until GS and MMS provide them with certain types of information. Under the current process, these data have been submitted in the form of a resource report about two months before the Call for Nominations (which now has been replaced by the Call for Information). Under the streamlined process, GS and MMS provide BLM with a geology report and an exploration and development report, 12 and 8 months respectively, prior to the Call for Information. The early receipt of this data allows immediate initiation of preparation of certain portions of the EIS. This has reduced the post-Call preparation time of an EIS by 15 months.

2. Planning Area-Wide Offerings and Favorable Geological Area Offerings as Opposed to Tract Selection Process

The entire planning unit (Alternative I Option 1) or the Favorable Geological Area (Alternative I, Option 2), less those areas removed because of statutes, reason of national security, or as determined necessary or appropriate by the Secretary of the Interior could be offered for lease. Under the current process, tracts offered for lease are generally concentrated in smaller areas. Under the streamlined process, the offered areas would be spread out over a larger area.

The rationale for area-wide or favorable geological area offerings is as follows:

- Significant domestic energy resources are believed to be located on the OCS, but the precise quantities and locations are unknown because promising frontier areas have not been explored thoroughly.

- Different geologists develope different interpretive views on the probable location of oil and gas in any one planning area.

- The best way to accelerate discovery of significant oil and gas deposits is to encourage companies to pursue unique and diverse exploration strategies based on these different views.

- In the current process the Federal government makes judgments about which tracts are or are not likely to be bid on. The streamlined process will allow companies to concentrate their efforts on tracts they consider most promising, unless those tracts have been deleted for other reasons through the pre-sale planning process.

- The diverse exploration strategies which will be tested under the streamlined process are necessary in order to fully test an area. Only a small percentage of a planning area can be expected to contain economically producible resources and it would probably slow the geologic delineation of an area if small portions of it are made available on a piecemeal basis.

The history of the search for hydrocarbons contains many examples of years of fruitless drilling in a region, then suddenly a commercial find, followed by continued successes. Prudhoe Bay in Alaska, the Hibernia field in the Canadian Atlantic, and the North Sea are all prime examples of this scenario. The Department believes that by broadening the range of possibilities from which industry can select, we will expedite this process in those OCS areas where commercial deposits of hydrocarbons may eventually be found.

While the size of each sale proposal may broaden the scope of review by State and other interested parties, the usual opportunities for public review will remain. Some of the proposed streamlining steps, such as area-wide NEPA documents, followed by supplemental NEPA documents covering information gathered since the first EIS was prepared, will serve to ease the paperwork burden and should improve the States' and other interested parties' abilities to review the sales within a comprehensive framework. Also, since the area of pre-sale study will be known well in advance once the 5-year program is adopted, interested parties need not await the Call for Information and the Area Identification milestones before they start their reviews.

Formerly much of the environmental impact analysis was not begun until approximately three months after tract selection. This time was needed to estimate the expected amounts of oil and gas the selected tracts contained - a process which could not begin until after tlhe tracts were selected. Under the streamlined process, the Call for Information will cover the entire planning area (except for areas excluded because of statutes, reasons of national security, or as deemed necessary by the Secretary of the Interior). This makes it possible to estimate the amounts of oil and gas which might be recovered much earlier in the leasing process and consequently, environmental impact analysis can begin earlier.

3. Changes in the Environmental Studies Program

As a result of recommendations of the Interagency Committee on Ocean Pollution Research, Development and Monitoring, analysis of the usefulness of information currently generated by the studies program, budgeting constraints, and other factors, several changes to the environmental studies program were evaluated. These changes were also evaluated to determine whether, with the modifications under consideration, the Environmental Studies Program could support an accelerated schedule. Acceleration was determined to be feasible with the new approach, and a strategy has been adopted which provides better balance between pre-sale and post-sale studies. Under this new strategy basic information will still be collected through regional reconnaissance studies. Site-specific, pre-sale studies will also continue to be conducted where location of unique or sensitive sites coincide with known industry exploration and production interests. These efforts, in combination with available information, will provide an appropriate basis for the pre-sale NEPA process.

By limiting site-specific, pre-sale studies to those absolutely necessary, in favor of broader reconnaissance studies, increased efforts will be possible in generic fate-and-effects research which will be applicable to leasing decisions in all regions. Additionally, more post-sale, site-specific monitoring studies will be performed. (Such studies are currently underway in Georges Bank and are being initiated in Southern California.) These monitoring studies will be designed in the context of an integrated monitoring strategy developed to provide information on key areas of concern applicable to more than one planning area. They will also draw upon information developed through reconnaissance studies.

In addition to post-sale monitoring, there will be continued reconnaissance studies to provide a long-term data base on critical species and habitats and processes of special concern, tailored to the information needs and concerns in each area. These studies will generally be broader in scope than monitoring studies, providing a basis to detect, for example, effects on populations or habitat use within a region. Monitoring studies will concentrate on identifying changes in key parameters in exploration and development areas, to evaluate such issues as effects on whale migration and behavior, social effects and space-use conflicts. This combination of complementary post-sale monitoring and continued reconnaissance, carefully designed to answer questions about specific types of effects, should provide better information for permit evaluations and verifications of predicted effects, as well as for pre-sale evaluations of subsequent sales. These post-sale studies, and generic fate-and-effects studies, will also provide the basis for the evaluation of long-term, low level effects of OCS development.

In addition to federally-sponsored post-sale studies, industry will be required to perform some post-sale monitoring in all lease areas, probably focusing on near-rig effects of specific exploration and development activities. BLM will carefully coordinate its research activities with those required of industry to avoid duplication and assure that complementary research efforts are undertaken to develop needed information.

The level of information provided by the reconnaissance type study is sufficient to make informed lease-sale decisions. Most resources which might be impacted by OCS oil and gas activities are not confined to a specific tract or just a few tracts. Fisheries, endangered species and fish spawning areas are examples of resources which may move widely throughout the area or may be located generally over a large number of tracts.

4. <u>Changes in Geohazards Studies</u>

Rather than collecting tract specific geohazard data in advance of a sale, which results in data collected on many tracts which are not leased, detailed site surveys conducted by industry will be used in evaluating permits. Prior to a sale, USGS will provide to BLM information from regional geohazard studies for use in preparing the pre-sale NEPA document, writing lease stipulations, and identifying geological hazards processes and areas on a broad scale. MMS will use USGS data, existing MMS data and data obtained from industry through governmental regulations to guide post-sale decisions. The very detailed tract-specified geohazard information required of lessees prior to approval of exploration and development and production plans together with regional information will be used by MMS in evaluation of both types of plans to make sure that proposed operations are properly designed and safe. Essentially this recognizes that, with or without streamlining, MMS requires, under OCS operating orders, that detailed, site-specific bottom surveys be

conducted prior to initiation of operations affecting the seabed. The amount and location of data required will depend upon the state of knowledge about geohazards in any particular sale area. This approach avoids duplication of data-gathering over leased tracts and needless acquisition of data for tracts not sold. The MMS will continue to require whatever steps are necessary to assure safe operations, including drilling locations outside of hazard zones. We believe this is a much more efficient and effective approach, because, if appropriate or necessary, as guided by data from the regional studies, DOI will require operators to collect more detailed information than was gathered through pre-sale studies conducted by USGS in the past. This change was proposed independent of the streamlining initiatives and will be implemented whether or not the proposed program is adopted. Thus, relying on industry site surveys, which was the practice prior to 1976, is much more cost-effective.

5. Changes in Method of Assuring Fair Market Value

Analysis of the current procedure for assuring fair market value--estimating the value of each tract offered prior to the sale -- indicated that it was not the most cost-effective way to meet this statutory requirement. The proposed new system will place greater reliance on the competitive leasing market while still retaining a government screening process to provide a credible and cost-effective deterrent to underbidding and collusion. Under the new system, evaluation of fair market value will be done post rather than pre-sale. Also, only a portion of tracts receiving bids will be evaluated. For example, more one or two-bid tracts will be evaluated than three-bid tracts. Also, all drainage, proven, and development tracts are likely to be evaluated. This change will be implemented whether or not the proposed program is adopted because it is more efficient and cost-effective than the current system.

C. Generic Impacts of Streamlined Procedures

The adoption of the proposed schedule carries with it two significant changes from present procedures. First, the entire leasing process will be administratively "streamlined" and secondly, the entire planning area or the favorable geological acreage will be offered at each sale. These changes are closely linked to the adoption of this alternative as the size and timing of sales could not be accommodated under the current leasing process.

The streamlining of the OCS leasing process will result in numerous administrative changes. Some of those changes will call for considerable modifications in the way industry relates to government in determining areas for inclusion in sales (broad areas will be identified instead of specific tracts); a large portion of the modelling and EIS preparation effort will now precede the initiation of the formal pre-leasing process; industry, States, local governments, and public interest groups may be required to respond more quickly to requests for information or review; and more emphasis will be placed on post-sale hazards evaluation, comment and monitoring. The impacts of the proposed changes are discussed below:

Call for Information: Rather than ask for tract specific data and the nomination of individual tracts, industry, other Federal agencies, States and local governments, special interest groups and the general public will be asked to provide information concerning areas within a planning area. General and specific information about the area as well as recommendations for leasing areas and areas to be deleted from leasing consideration will be accumulated in this manner. With available information and that produced through reconnaissance studies, based on previous experience, it is anticipated that sufficient information will be available to insure that areas included in the sale will not present unacceptable environmental risks. In the past, most sensitive areas and conflicts have been identified initially at the Call for Nominations stage when the area under consideration is quite broad. We expect that this will continue, however, it is conceivable that area-wide offerings could lead to the inclusion of areas for sale consideration that, because of biological sensitivity, special hazards, cultural resources and multiple use conflicts, would not have been included for consideration in the more limited tract specific analysis. Later stages of analysis will be relied upon to provide the necessary safeguards against activities which might adversely affect resources.

The time allotted for response to the Call for Information is reduced. However, since the entire planning area will be up for consideration, respondents will not be required to wait for the call areas to be identified as in the past, before preparing their comments. Instead, once a schedule is approved, organizations and individuals will be able to prepare, as far as three or four years in advance, replies to the various calls for information.

Area Identification: Offering for lease an area covering all or the geologically favorable part of an entire planning area will have a number of different effects. First, industry will be able to consider leasing throughout the identified area; therefore consideration will have to be given to planning, by State and local governments, for possible development scattered over a very large area. It is expected that information will quickly become available concerning the location of most promising hydrocarbon producing sections, and planning will concentrate on development in those areas. The possibility will remain, if entire planning areas are offered, that leasing and development may occur beyond the areas expected to be developed, causing impacts where not fully anticipated. This problem would occur under the geologically favorable acreage offering. Studies designed to provide information about the assumed high potential leasing areas would not provide detailed information about impacts which might result from unexpected development in an unstudied area.

Finally, larger offerings may result in a greater likelihood of adverse environmental impacts. This may be less critical in the Central and Western Gulf of Mexico than in other OCS regions since leasing in the Gulf as been relatively widespread in the central and western parts. In the eastern Gulf and other parts of the OCS, the area subjected to impacts can be expected to expand beyond that of presently active areas.

Area Wide EIS: Environmental Impact Statements covering large OCS areas are now being prepared for sales under the current schedule and leasing system. Emphasis can be and is placed on the specific set of tracts nominated for leasing, but in reality the entire planning area is analyzed as thoroughly as time and available information permits. Under the area-wide concept or the favorable geological acreage concept, an entire planning area will not be treated as having marine and hydrocarbon resources distributed evenly across it. Areas where oil and gas are believed most likely to occur will be identified and the analysis will focus on the effects of OCS activities there. The Department of the Interior will prepare the analysis much in the manner of the present tract-specific EIS. The area wide EIS or an EIS prepared for a favorable geological acreage offering will include thorough consideration of the expected quantities of oil and gas resources, their expected location, exploration and development scenarios, transportation systems, potential spill locations, statistics of potential spill frequencies, their fates, and potential risks and conflicts with other marine and coastal resources. As a result of the Geology Report (see Section II.A) and the Call for Information, determinations will be made concerning the most likely locations for hydrocarbon resources. Additionally, areas which warrant particular consideration will be delineated. Special stipulations or lease terms will be designed and evaluated in order to mitigate potential impacts. In this sense, there will be few changes in the way OCS lease sale EIS's are prepared.

Geohazards Evaluation: Because specific tracts will no longer be identified early in the pre-leasing process, and because up to 2,000 or more lease blocks could be considered hydrocarbon prone, tract specific geohazards surveys will no longer be possible. Instead, a regional geohazards evaluation will be available for inclusion in the EIS. This general hazards evaluation will be based on regional characterizations which will focus on areas of high oil and gas potential and areas with the greatest potential for geologic hazards such as slopes. Under these circumstances the EIS will only identify broad areas of potential hazardous conditions (see Section I.B.4). Site specific geohazard surveys will be required of lessees for approval of exploratory and development plans. Should operations not be possible at the chosen site, an operator may be required to relocate to other parts of a lease, or a permit issued to operate from outside the lease. In extreme circumstances, where operations simply cannot be carried out in an environmentally acceptable manner, the Secretary may cancel the lease. In this case the operator would be entitled to compensation (see Section I.B.4.e).

Planning Area Boundary Changes: The Department of the Interior is also proposing to make changes in the boundaries of the OCS planning areas (compare maps in Section III.A). In the Atlantic OCS the biggest change is the combination of the North and Mid-Atlantic areas into a new, much larger North Atlantic planning area. The principal significance of this will be to combine sales formerly split between the Mid and North Atlantic OCS leasing areas (this EIS, nevertheless, evaluates both planning areas). Under the June 1980 program sales have been alternated between the two regions and the South Atlantic so

one sale could be expected in each area about once every three years. Under the proposal, sales are scheduled to occur once every two years within the larger proposed planning area. Except for the effects associated with the closer spacing of sales, the impacts of combining these two areas should not be significant.

In the South Atlantic area, two changes have taken place. The Blake Plateau has been combined with the South Atlantic planning area, and the southern boundary has been extended southwards along the Florida coast beyond Cape Canaveral. Neither change is expected to have a significant effect since Blake Plateau leasing will cause coastal development to occur in the same locations that more near shore leasing would, and the extension of the boundary southward merely expands the planning area into a geologic province presently expected to have no hydrocarbon potential. If this area were to prove hydrocarbon prone however, the change would result in a higher probability of impacts occurring off the east coast of Florida.

The division of the Gulf of Mexico into three larger planning area will mean that the Eastern Gulf will be subject to annual sales. Dividing the western and central areas of the Gulf should result in more effective planning for the development of these two non-frontier areas.

The elimination of the small Santa Barbara planning area in California will have little actual effect since it has been included as part of the southern California call areas in recent sales. However, the decision to combine the two into one planning area removes the option of scheduling sales separately in the future, and in that manner reducing the rate of leasing.

Adding a planning area to the west of Kodiak (Shumagin) identifies a specific planning area in a part of the OCS which has not been previously proposed for leasing consideration. Including Shumagin in Sale 100 could ultimately result in leasing and development and attendant impacts in this region.

Expanding the former North Aleutian Shelf leasing area to include all of Bristol Bay, renaming it the North Aleutian Basin, and offering the entire planning area for leasing introduces the possibility of OCS related impacts occurring within the sensitive fishing grounds of Bristol Bay. However, the most promising formations are outside of the heaviest fishing areas. This should serve to reduce the potential for environmental impact and multiple use conflicts within this planning area.

Subdividing the St. George Basin into three areas, Bowers Basin, Aleutian Basin and a smaller St. George Basin will have little practical effect since there is presently no apparent industry interest in the Bowers and Aleutian Basins. The subdivision serves only to focus the area of study and planning on the actual locations of industry interest.

Changing the Navarin Basin eastern boundary to 174° W and defining a new area, St. Matthew-Hall, will serve to remove the direct possibility of leasing taking place along the central Bering Sea coast. Leasing, development, and direct impacts on marine ecosystems will take place no closer than 250 miles to mainland although the effects of oilspills and onshore support bases will extend beyond the lease area and could likely impact portions of the coast in the region.

III. DESCRIPTION OF THE ALTERNATIVES

Table III-1 indicates the proposed timing and location of sales for each alternative described in this section. For a similar table on the Alternatives discussed in the FEIS, see page 35 of that document. The alternatives analyzed in this supplement are described below.

A. Alternative I. The Proposed Schedule of July 1981

1. Option 1. The Proposed Schedule with Area-Wide Offerings

a. Description of Alternative I-1

The proposed action is the adoption of a 5-year OCS oil and gas lease sale schedule using a new "streamlined" leasing approach.

1) The Schedule: The proposed schedule is a modification of the April 1981 draft proposed schedule discussed in the DSEIS. The proposed schedule was released in July 1981, and consists of 42 oil and gas lease sales on the Outer Continental Shelf. The timing (by month), and location by OCS planning area of these sales is illustrated by Figure III-2.

The proposed schedule will generally have one sale in the Atlantic OCS per year, except 1983 when two are scheduled. The first sale on the schedule, Sale No. 52, had moved far enough into its pre-lease steps that streamlining was not possible, so it will be held as a tract selection type sale. Sale No. 76, in the Mid-Atlantic, would be the first sale on the proposed schedule to encompass the area-wide offering concept and the planning area-wide Environmental Impact Statement.

The schedule drops reoffering sales after 1982, as these should be unnecessary with the proposed leasing system. Reoffering sales were originally designed to allow industry to bid upon tracts not leased during the sales held in the year prior to the reoffering, since those tracts might not appear in the next sale scheduled in the planning area. Under the planning area-wide sale concept any tract not leased in one sale would probably be included in the next sale, making reoffering sales redundant. The DSEIS presented an alternative (Alternative 6, described on page 21 of the DSEIS) which proposed dividing the Gulf of Mexico Planning Area into three regions, offering each once per year, making room in the schedule for such a proposal by dropping reoffering sales after RS-2. That alternative has been included in this proposal, and is therefore dropped as a separate alternative. Starting in 1983, three sales per year will be scheduled in the Gulf, one in each of the planning areas; Western, Central, and Eastern. Very little leasing and exploration has taken place in the Eastern Gulf up to this point, but it is not expected that the pace of exploration and development there will reach the levels experienced in the Central and Western Gulf. Holding one sale per year during the period in which this Alternative is in effect would allow industry to determine if this area, which borders on one of the most prolific hydrocarbon producing areas in the world, is itself productive.

Leasing along the West Coast continues at the pace of one sale per year along the California coastline. The DSEIS presented an alternative (Alternative 4, described on page 19 of the DSEIS) which proposed identifying lease sales in

Figure III-1

SUMMARY OF ALTERNATIVE SCHEDULES

Alternatives I-1 and I-2

1982

67 Gulf of Mexico
68 S. California
RS-2
52 N. Atlantic
71 Diapir Field
69 Gulf of Mexico
57 Norton Basin

1983

73 C&N California
70 St. George Basin
76 Mid Atlantic
75 N. Aleutian Basin
72 C. Gulf of Mexico
78 S. Atlantic
74 W. Gulf of Mexico
79 E. Gulf of Mexico

1984

80 S. California
82 N. Atlantic
83 Navarin Basin
81 C. Gulf of Mexico
87 Diapir Field
84 W. Gulf of Mexico
88 Norton Basin
94 E. Gulf of Mexico
89 St. George Basin

1985

90 Atlantic
85 Barrow Arch
91 C&N California
92 N. Aleutian Basin
98 C. Gulf of Mexico
86 Hope Basin
102 W. Gulf of Mexico
100 S. Alaska
103 E. Gulf of Mexico

1986

95 S. California
96 Atlantic
107 Navarin Basin
104 C. Gulf of Mexico
97 Diapir Field
105 W. Gulf of Mexico
99 Norton Basin
106 E. Gulf of Mexico
101 St. George Basin

Alternative II

1982

67 Gulf of Mexico
68 S. California
57 Norton Basin
RS-2
52 North Atlantic
71 Diapir Field
69 Gulf of Mexico
70 St. George Basin

1983

73 California
76 Mid Atlantic
75 N. Aleutian Basin
72 Gulf of Mexico
RS-3
78 S. Atlantic
74 Gulf of Mexico
83 Navarin Basin

1984

80 California
82 N. Atlantic
87 Diapir Field
79 Gulf of Mexico
88 Norton Basin
RS-4
89 St. George Basin
81 Gulf of Mexico

1985

85 Barrow Arch
90 Atlantic
91 California
84 Gulf of Mexico
RS-5
92 N. Aleutian Basin
86 Hope Basin
93 St. Matthew Hall
94 Gulf of Mexico

1986

95 California
96 Atlantic
97 Diapir Field
98 Gulf of Mexico
RS-6
99 Norton Basin
100 S. Alaska
101 St. George Basin
102 Gulf of Mexico

Alternatives III-1 and III-2

1982

67 Gulf of Mexico
RS-2
68 S. California
69 Gulf of Mexico
57 Norton Basin
52 North Atlantic
70 St. George Basin

1983

71 Diapir Field
72 Gulf of Mexico
73 California
RS-3
74 Gulf of Mexico
75 N. Aleutian Basin
76 Mid Atlantic

1984

78 South Atlantic
79 Gulf of Mexico
RS-4
80 California
81 Gulf of Mexico
82 N. Atlantic
83 Navarin Basin

1985

84 Gulf of Mexico
85 Barrow Arch
86 Hope Basin
RS-5

Alternatives IV-1.a and IV-1.b

1982

67 Gulf of Mexico
68 S. California
RS-2
52 North Atlantic
71 Diapir Field
69 Gulf of Mexico
57 Norton Basin

1983

73 C&N California
76 Mid Atlantic
72 C. Gulf of Mexico
78 S. Atlantic
74 W. Gulf of Mexico
79 E. Gulf of Mexico

1984

80 S. California
82 N. Atlantic
81 C. Gulf of Mexico
87 Diapir Field
84 W. Gulf of Mexico
100 S. Alaska
94 E. Gulf of Mexico

1985

90 Atlantic
91 C & N California
98 C. Gulf of Mexico
83 Navarin Basin
102 W. Gulf of Mexico
97 Diapir Field
103 E. Gulf of Mexico

1986

95 S. California
96 Atlantic
70 St. George Basin
104 C. Gulf of Mexico
99 Norton Basin
105 W. Gulf of Mexico
85/86 Hope/Barrow
106 E. Gulf of Mexico

Alternatives IV-2.a and IV-2.b

1982

67 Gulf of Mexico
68 S. California
RS-2
52 North Atlantic
69 Gulf of Mexico
57 Norton Basin

1983

73 C&N California
70 St. George Basin
76 Mid Atlantic
75 N. Aleutian Basin
72 C. Gulf of Mexico
78 S. Atlantic
74 W. Gulf of Mexico
79 E. Gulf of Mexico

1984

80 S. California
82 N. Atlantic
83 Navarin Basin
81 C. Gulf of Mexico
84 W. Gulf of Mexico
88 Norton Basin
94 E. Gulf of Mexico
89 St. George Basin

1985

90 Atlantic
91 N & C California
92 N. Aleutian Basin
98 C. Gulf of Mexico
102 W. Gulf of Mexico
100 S. Alaska
103 E. Gulf of Mexico

1986

95 S. California
96 Atlantic
107 Navarin Basin
104 C. Gulf of Mexico
105 W. Gulf of Mexico
99 Norton Basin
106 E. Gulf of Mexico
101 St. George Basin

Figure III- 2

PROPOSED 5-YEAR OCS OIL AND GAS LEASING SCHEDULE

U.S. DEPARTMENT OF THE INTERIOR JULY 1981

SALE AREA	Proposed Date	1982												1983												1984												1985												1986											
		J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
67 Gulf of Mexico	2/82	N	S																																																										
68 S. California	4/82		G/R	N	S																																																								
RS-2	6/82		P		G/R	N	S																																																						
52 North Atlantic	8/82				F/P		G/R	N	S																																																				
71 Diapir Field	9/82	E		H		F/P		G/R	N	S																																																			
69 Gulf of Mexico	10/82						P		G/R	N	S																																																		
57 Norton Basin	11/82		F					P		G/R	N	S																																																	
73 C&N California	1/83				E		H			F/P		G/R	N	S																																															
70 St. George Basin	2/83				H				F		P		G/R	N	S																																														
76 Mid Atlantic	3/83						E		H			F/P		G/R	N	S																																													
75 N. Aleutian Basin	4/83								E		H		F/P		G/R	N	S																																												
72 C. Gulf of Mexico	5/83								E		H			F/P		G/R	N	S																																											
78 So. Atlantic	7/83										E		H			F/P		G/R	N	S																																									
74 W. Gulf of Mexico	8/83								E		H			F			P		G/R	N	S																																								
79 E. Gulf of Mexico	11/83								E		H			F						P		G/R	N	S																																					
80 S. California	1/84					C	D		A									E		H		F/P		G/R	N	S																																			
82 N. Atlantic	2/84						C	D		A								E		H			F/P		G/R	N	S																																		
83 Navarin Basin	3/84				C	D		A											E		H			F/P		G/R	N	S																																	
81 C. Gulf of Mexico	4/84								C	D		A								E		H			F/P		G/R	N	S																																
87 Diapir Field	6/84										C	D		A									E		H		F/P		G/R	N	S																														
84 W. Gulf of Mexico	7/84								C	D		A								E		H			F			P		G/R	N	S																													
88 Norton Basin	10/84														C	D		A									E		H		F/P		G/R	N	S																										
94 E. Gulf of Mexico	11/84								C	D		A								E		H			F							P		G/R	N	S																									
89 St George Basin	12/84																C	D		A									E		H		F/P		G/R	N	S																								
90 Atlantic	1/85																	C	D		A									E		H		F/P		G/R	N	S																							
85 Barrow Arch	2/85																		C	D		A									E		H		F/P		G/R	N	S																						
91 C&N California	3/85																			C	D		A									E		H		F/P		G/R	N	S																					
92 N. Aleutian Basin	4/85																				C	D		A									E		H		F/P		G/R	N	S																				
98 C. Gulf of Mexico	5/85																					C	D		A									E		H		F/P		G/R	N	S																			
86 Hope Basin	7/85																							C	D		A									E		H		F/P		G/R	N	S																	
102 W. Gulf of Mexico	8/85																					C	D		A									E		H		F			P		G/R	N	S																
100 S. Alaska*	10/85																										C	D		A									E		H		F/P		G/R	N	S														
103 E. Gulf of Mexico	11/85																					C	D		A									E		H		F						P		G/R	N	S													
95 S. California	1/86																													C	D		A									E		H		F/P		G/R	N	S											
96 Atlantic	2/86																														C	D		A									E		H		F/P		G/R	N	S										
107 Navarin Basin	3/86																															C	D		A									E		H		F/P		G/R	N	S									
104 C. Gulf of Mexico	4/86																																C	D		A									E		H		F/P		G/R	N	S								
97 Diapir Field	6/86																																		C	D		A									E		H		F/P		G/R	N	S						
105 W. Gulf of Mexico	7/86																																C	D		A									E		H		F			P		G/R	N	S					
99 Norton Basin	10/86																																							C	D		A									E		H		F/P		G/R	N	S		
106 E. Gulf of Mexico	11/86																																C	D		A									E		H		F						P		G/R	N	S	
101 St. George Basin	12/86																																									C	D		A									E		H		F/P		G/R	N	S

C - Call for Information
D - Information Due
A - Area Identification
E - NEPA Document
H - Public Hearing

F - NEPA Document
P - Proposed Notice of Sale
G - Governors' Comments Due
R - DOE Review
N - Notice of Sale
S - Sale

* includes Cook Inlet, Shumagin, Kodiak, Gulf of Alaska

the California OCS by planning area rather than by using the term "California" and specifying the exact location of the sales at a later date. It was decided to include that alternative in this proposal. Sales now listed in the proposed schedule alternate between the Southern California and the Central and Northern California planning areas. No sales are presently proposed in the Washington-Oregon planning area due to a lack of industry interest.

The Alaska OCS is larger than the entire OCS along the coasts of the lower 48 States. Planning Areas there include roughly 815 million acres as against 444 million acres for the Atlantic, Gulf, and Pacific OCS areas combined. Because of the hydrocarbon potential and extremely large size of the Alaska OCS, more sales are scheduled there than in any other region, including the Gulf of Mexico. Much of what is known about the potential of the Alaska OCS is through inference from seismic exploration, and a small amount of drilling. This proposal lists 4 sales in 1982 and 1983 which will be tract selection type sales offering limited acreage. Those offerings will continue the present pace of leasing through 1983, but in 1984 and thereafter, four sales per year are listed. These will be planning area-wide offerings, greatly increasing industry's opportunity to quickly explore and inventory and the resources of this vast area, and to develop of the resources located in the process.

A number of changes were made in the Alaska OCS schedule between the issuance of the DSEIS and the development of this proposal (between the issuance of the April and July Schedule).

-- Two changes have been made to allow for the completion of planned pre-sale stratigraphic testing: Sale No. 57 - Norton Sound has been moved from May 1982 to November 1982, and Sale No. 83 - Navarin Basin has been moved from December 1983 to March 1984.

-- Five changes have been made to take into account the limited field seasons off Alaska: Sale No. 87 - Diapir Field has been moved from March 1984 to June 1984, Sale No. 88 - Norton Basin has been moved from June 1984 to October 1984, Sale No. 92 - North Aleutian Basin has been moved from June 1985 to April 1985, Sale No 97 - Diapir Field has been moved from March 1986 to June 1986, and Sale No. 99 - Norton Basin has been moved from June 1986 to October 1986.

-- Sale No. 93 - St. Matthew-Hall has been deleted and replaced with a second sale in the Navarin Basin because of the higher potential of that area. The second Navarin sale is proposed for March 1986.

-- Sale No. 100 - South Alaska has been moved to October 1985 from August 1986 to provide for an earlier opportunity to study this area in the event discoveries are made on leased acreage in either Gulf of Alaska or Cook Inlet.

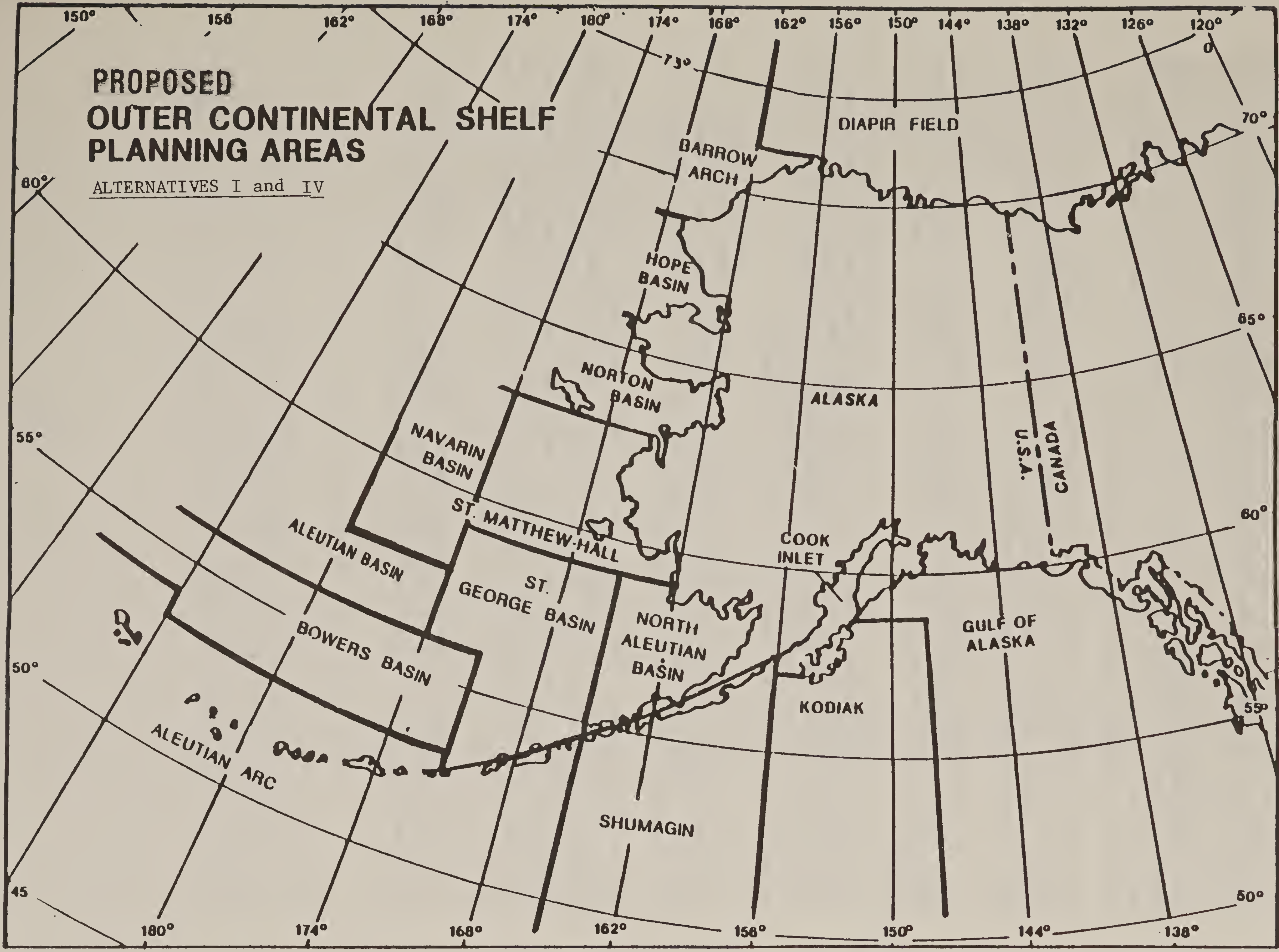
2. <u>The Proposed Planning Areas</u>: It is being proposed that a new set of OCS Planning Area boundaries be adopted for future sales, and that the names of some areas be changed to better reflect the underlying geologic structures with hydrocarbon potential (See Figures III-3 and III-4). The new boundaries have been drawn using older boundaries where possible, and adding new lines, or changing old ones based on geologic and environmental characteristics.

PROPOSED
OUTER CONTINENTAL SHELF PLANNING AREAS

ALTERNATIVES I and IV

U.S. Department of the Interior Map

Figure III-3



U.S. Department of the Interior Map

Figure III-4

Planning areas along the coasts of the lower 48 States have been further identified by adding an outer boundary, by indicating the locations and names of the three Gulf of Mexico areas, and by combining the former Mid and North Atlantic areas into one new North Atlantic planning area. This consolidation has been made because the Jurassic reef, located on the North Atlantic Continental Slope, extends to the Mid-Atlantic; also, if commercial deposits of oil and gas are found in either area, the onshore support infrastructure is expected to center in New Jersey and Pennsylvania.

The South Atlantic and Blake Plateau areas have been combined into a new South Atlantic area, which will ease planning for future operations in the Blake plateau since onshore and nearshore effects of leasing in both former areas will center in the same coastal regions.

The Gulf of Mexico, formerly considered one planning area, has been divided into three, the Eastern (West of Florida), the Central (South of Alabama, Mississippi, and Louisiana), and the Western Gulf of Mexico (south and east of Texas).

The coast of California is now bordered by two planning areas. In the south, the Southern California planning area includes the former Santa Barbara Channel and Southern California areas, since recent sales have included tracts in both. In the north, the Central and Northern California planning area remains unchanged except for the addition of the outer boundary.

In Alaska, the boundaries between the Gulf of Alaska, Kodiak, and Cook Inlet areas have been modified to better represent underlying geologic structures, and the Shumagin area has been added to the west of Kodiak to provide a planning basis for potential sales in the future.

In the Bering Sea, the Norton Basin remains unchanged. The small North Aleutian Shelf has been expanded into a larger North Aleutian Basin which new includs a large area to the north of the North Aleutian Shelf, which had no planning status. The large St. George Basin has been divided into four new areas, the St. George Basin to the east, and the Aleutian Basin, Bowers Basin and Aleutian Arc to the west. The Navarin Basin has been subdivided into the Narvarin Basin in the west and St. Matthew-Hall in the east.

In the Arctic Ocean, the Hope basin remains unchanged. Barrow Arch, formerly the Chukchi Sea, is reduced in size so that certain geologic formations could be consolidated into the Diapir Field, formerly called the Beaufort Sea.

TABLE III-I
PROPOSED PLANNING AREAS AND APPROXIMATE SIZES
ALTERNATIVE I

AREA		MILLIONS OF ACRES
ATLANTIC		
North		139
South		99
	Subtotal	238
GULF OF MEXICO		
Western		35
Central		46
Eastern		58
	Subtotal	139
PACIFIC		
Southern California		22
Central and Northern California		37
Washington, Oregon*		33
	Subtotal	92
ALASKA		
Gulf of Alaska		133
Kodiak		89
Cook Inlet		8
Shumagin		84
Aleutian Basin*		160
North Aleutian Basin		32
Bowers Basin*		86
St. George Basin		70
Aleutian Arch*		54
Navarin Basin		37
St. Matthew-Hall*		51
Norton Basin		25
Hope Basin		12
Barrow Arch		30
Diapir Field		49
	Subtotal	920
	Total	1389

* Planning Areas in which no sales are proposed in this alternative.

Of the planning areas listed above, four have no sales proposed in any of the alternatives to be discussed in this document. By subtracting the total of acreage within those non-sale planning areas from the total approximate OCS acreage, a figure of 875 million acres is obtained, which indicates the maximum approximate total of the OCS that could be offered at least once during the period covered by this alternative.

3) <u>Area-Wide Offerings</u>: An integral part of this proposal is the concept of offering all tracts in a planning area to industry, for consideration for leasing, except those already leased in previous sales, or those not available for leasing because of national defense needs, environmental considerations, or other reasons. The maximum amount of acreage available for leasing will thus be offered, opening much larger amounts of the OCS to exploration and possible hydrocarbon development. A description of area-wide leasing and a rationale for it may be found in Chapter II.

When the DSEIS was prepared, no estimates of the acreage to be leased at each sale on the schedule were available. Since that time the schedule has been examined to arrive at an estimate of the range of acreage which might be leased as a result of each sale. These are presented in Table III-3. The assumptions used to arrive at the estimates are:

1) Total planning areas would be offered starting with Sales 76 and 72 in 1983.

2) Non-area-wide figures (1982 sales) are based on leasing history in those planning areas.

3) A greater amount of acreage would be leased under streamlining, but a smaller <u>percent</u> of the offering would be leased.

4) Industry would lease more acreage in relatively unknown areas to reduce economic risk.

5) Repeat sales in an area would result in a smaller percent of the area leased with each repeat sale.

The acreage estimates were based on industry interest, geologic structure maps, and the total resource levels estimated by the U.S. Geological Survey for the DSEIS. The principal guiding assumption which determined the general range of the estimates was that industry would only be interested in that part of each planning area covered by potential hydrocarbon producing structures.

One of the main indicators of the amounts of acreage of interest to industry is the percent of each planning area estimated by USGS to be underlain by structures which have promise of being oil and gas bearing in nature. These are, of course, preliminary estimates calculated only for the development of the acreage estimates mentioned above. However, they do give an idea of the relatively small percent of each planning area in which industry will be likely to show interest.

TABLE III - 3
Estimated Acreage That Could Be Leased for the Proposed
5-Year Schedule

Sale	Range of Area Leased (Acres)
1982	
67 Gulf of Mexico	698,000
68 S. California	340,000
RS-2	220,000
52 North Atlantic	930,000
71 Diapir Field	575,000
69 Gulf of Mexico	772,000
57 Norton Basin	821,000
1983	
73 Central & Northern California	225,000 - 980,000
70 St. George Basin	807,000 - 1,340,000
76 Mid-Atlantic	860,000 - 2,600,000
75 N. Aleutian Basin	1,025,000 - 1,707,000
72 C. Gulf of Mexico	470,000 - 1,400,000
78 S. Atlantic	280,000 - 1,220,000
74 W. Gulf of Mexico	460,000 - 1,410,000
79 E. Gulf of Mexico	180,000 - 780,000
1984	
80 S. California	250,000 - 740,000
82 N. Atlantic	250,000 - 750,000
83 Navarin Basin	1,280,000 - 2,880,000
81 C. Gulf of Mexico	235,000 - 700,000
87 Diapir Field	1,530,000 - 3,000,000
84 W. Gulf of Mexico	230,000 - 690,000
88 Norton Basin	260,000 - 640,000
94 E. Gulf of Mexico	90,000 - 390,000
89 St. George Basin	1,020,000 - 2,480,000
1985	
90 Atlantic	430,000 - 1,290,000
85 Barrow Arch	1,120,000 - 2,520,000
91 Central & Northern California	110,000 - 490,000
92 N. Aleutian Basin	80,000 - 240,000
98 C. Gulf of Mexico	240,000 - 710,000
86 Hope Basin	400,000 - 1,200,000
102 W. Gulf of Mexico	230,000 - 690,000
100 S. Alaska	40,000 - 240,000
103 E. Gulf of Mexico	90,000 - 390,000
1986	
95 S. California	250,000 - 740,000
96 Atlantic	250,000 - 750,000
107 Navarian Basin	640,000 - 1,440,000
104 C. Gulf of Mexico	240,000 - 710,000
97 Diapir Field	1,530,000 - 3,060,000
105 W. Gulf of Mexico	230,000 - 690,000
99 Norton Basin	260,000 - 640,000
106 E. Gulf of Mexico	90,000 - 390,000
101 St. George Basin	1,020,000 - 2,480,000

TABLE III-4
Estimates of the Amount of OCS Planning Areas Covered by Promising Geologic Structures

Planning Area	Total Acreage Millions of Acres	Geologic Structures Millions of Acres
North Atlantic (Proposed New Area)	139	17.3
South Atlantic	99	9.4
Eastern Gulf of Mexico	58	6.0
Central Gulf of Mexico	46	9.4
Western Gulf of Mexico	35	9.3
Southern California	22	9.9
Central & Northern California	37	7.5
South Alaska Sale Area (Gulf of Alaska, Kodiak, Cook, Shumagin)	314	2.0
North Aleutian Basin	32	3.2
St. George Basin	70	29.2
Navarin Basin	37	16.0
Norton Basin	25	7.5
Hope Basin	12	8.0
Barrow Arch	30	14.0
Diapir Field	49	30.6
	1005	179.3

4) <u>Summary of Activities Resulting from this Alternative:</u>

<u>Resource Estimates</u>: This document, and all sale specific EIS's, will use conditional estimates which assume the presence of commercially recoverable hydrocarbons. This type of estimate gives a more appropriate picture of what level of development might occur if oil and gas are found. The resource estimates used throughout this document were calculated from estimates obtained from a USGS Open File report printed in its entirety as Appendix 2. It should be noted that the estimates used in the FEIS were "risked" estimates. Such figures have the risk of not finding hydrocarbon resources in the leasing area factored into the calculations. This usually reduces the size of the resource estimate depending on how high the risks are of not finding hydrocarbons and consequently reduces all other estimates calculated from the resource levels. For example, if the risk of not finding hydrocarbon resources in an area is very high, the estimate of total resources, development, and possible oilspills will be reduced substantially.

<u>Resource estimates resulting from the adoption of this alternative</u>:

In calculating resource figures for this alternative, the percent of undiscovered recoverable oil and gas within each planning area which might be made available as a result of the scheduled sales in each area was estimated. This tends to follow a similar pattern in all petroleum basins and is being applied to the OCS in this instance to establish estimates for analysis of potential impacts. In most of the studied hydrocarbon basins, the largest, most easily discovered formations are located first, resulting in a high

percentage of the basin's resources being discovered early. Later efforts locate smaller and more difficult to find fields, causing the percent of the resource located per unit of effort (per year, per lease sale) to drop drastically. The concept is more fully explained by Root and Drew in their article, "The Pattern of Petroleum Discovery Rates," published in Vol. 67, No. 6 of the American Scientist, pages 648 to 652.

Table III-5
Conditional Mean Estimates of Resources to be
Recovered from Adoption of the Proposed Schedule (Alternative I-1)

Planning Area	Oil/billion bbls	Gas/Tcf	Transportation	Probability of Economic Success
North Atlantic	1.8	7.2	Tanker/Pipeline	.99
Mid Atlantic (For Sale 76 Only)	.8	3.4	Tanker/Pipeline	.99
South Atlantic	.4	1.5	Tanker	.84
E. G. of Mexico	.55	.7	Pipeline/Tanker	.87
C. G. of Mexico	.53	5.7	Pipeline	1.00
W. G. of Mexico	.13	2.3	Pipeline	1.00
S. California	.9	1.5	Pipeline/Tanker	1.00
C & N California	.5	.7	Tanker/Pipeline	.99
S. Alaska Sale Area	.1	.8	Pipeline/Tanker	1.00
N. Aleutian Shelf	.3	1.3	Pipeline/Tanker	.42
St. George Basin	.4	2.2	Pipeline/Tanker	.64
Navarin Basin	.6	3.7	Pipeline/Tanker	.76
Norton Sound	.2	1.6	Pipeline/Tanker	.57
Hope Basin	.1	.8	Pipeline/Tanker	.24
Barrow Arch	.3	1.0	Pipeline/Tanker	.76
Diapir Field	1.7	8.9	Pipeline	1.00
Total OCS*	8.3	39.5		

*Total OCS figures are calculated from OCS wide estimates and are not simply the totals of planning area conditional estimates.

The estimates in Table III-5 assume that commercial quantities of oil and gas will be located. The probability of economic success is an estimate of the level of certainty of finding commercial quantities of hydrocarbons in each planning area. For instance, it is almost certain that hydrocarbons will be located in the Central Gulf of Mexico, Southern California, or Diapir Field, because conditions are highly favorable. On the other hand, the level of certainty is very much lower in the Hope Basin, Norton Basin, or North Aleutian Basin. The probability of locating commercial quantities of hydrocarbons in those Alaska areas is thus low and will remain low until the data gathered from seismic remote sensing is augmented by exploratory well drilling.

Estimates of development expected to result from the adoption of this option: The following table presents the expected levels of offshore activity which could result from the exploration and delineation of hydrocarbon bearing formations, and the establishment of production platforms and associated wells. These numbers are based on the quantities of the resources expected, and on the number and complexity of formations understood to be in each potentially productive area. Included also are the estimated time periods during which each type of activity can be expected to occur, a period which generally starts

with the drilling of the first exploratory well, at least one year after the first sale, and ends with the drilling of the final production wells up to 25 years later. Production and maintainence activity, pipeline construction, and platform removal activity would, of course continue for a number of years beyond the drilling of the final production well. The normal life of the field, after all platforms are in production, is assumed to be 35 years. Also included in the table is the expected number of oilspills resulting from the production and transportation of oil in each planning area.

Table III-6, and 6b include estimates of activity in the Middle Atlantic planning area even though this alternative proposes to combine that area with the North Atlantic. This was done because the one remaining sale scheduled in the Mid Atlantic, Sale 76, would, under the adoption of this alternative, be a planning area-wide sale with the potential of causing a significant departure from levels of development predicted in the FEIS.

The table also lists development estimates for the South Alaska sale area rather than individual planning areas. Thus, because all four planning areas will be included in the Call for Information.

It must be remembered that these numbers are <u>estimates</u> of development based on <u>estimates</u> of resources, and are developed for evaluating the potential levels of impacts which might occur from the adoption of the proposed schedule. The likelihood of the listed development levels actually taking place may be roughly judged by referring to the "probability of economic success" column presented with the resource estimates. For instance, the prediction of five exploratory wells, nine production wells, one platform and .2 oilspills of ten thousand barrels or larger in the Hope Basin must be looked at in the light of the .24 probability factor. In other words, the likelihood of that level of development actually occurring is probably low.

Table (III-7) illustrates, for each planning area, the quantities of muds, cuttings and formation waters which can be expected to be released into the environment by the adoption of this schedule.

5) <u>Summary of Activities Resulting from the Development of all Resources within the Planning Areas</u>: Under this alternative, where all of the tracts, and therefore all of the resources in planning areas are offered for lease, it is possible - although considered very unlikely - that all of the resources in a given planning area might be leased and developed as a result of the adoption of this schedule. For such a possibility, estimates are provided of the total undiscovered quantities of oil and gas, and also calculated are estimates of the development necessary to recover all of the resources. These total development estimates are used in the analysis of cumulative impacts in Section V, since they include the development of already leased tracts, and also illustrate how much activity can be expected to take place in each OCS planning area by the time all resources are developed, regardless of the amount of time necessary to accomplish the task. These estimates are presented below.

TABLE III - 6
Estimated Development to Result from Adoption of Alternative I-1
The Proposed Schedule with Planning Area-Wide Offerings

Planning Area	Number of Wells: Exploratory	Number of Wells: Development/ Production	Number of Platforms	Number of Oil Spills: Production 1K bbls	Production 10K bbls	Transportation 1K bbls	Transportation 10K bbls	Exploratory Wells: First	Most Intense	Last	Platforms: First	Most Intense	Last	Devlpmt/Prod. Wells: First	Most Intense	Last
North Atlantic(#52)	28	123	5	.2	.1	1.1	.7	1983	1984-86	1992	1986	1988	1994	1987	1988-89	1996
North Atlantic (new)	134	698	28	1.3	.5	5.1	2.7	1985	1986-88	1996	1991	1993-95	2002	1992	1994-97	2007
Mid Atlantic	118	564	23	.6	.3	2.6	1.4	1984	1985-87	1993	1990	1991-93	1999	1991	1991-94	2004
South Atlantic	72	267	11	.3	.1	1.6	.9	1984	1986-88	1995	1987	1989-90	1997	1988	1989-91	1999
E.G.of Mexico	136	272	11	.4	.2	1.1	.6	1982	1984-86	1997	1985	1987-89	2000	1986	1988-90	2002
C.G.of Mexico	410	926	77	.3	.13	.7	.2	1982	1983-85	1997	1983	1985-87	1999	1983	1986-88	2001
W.G.of Mexico	225	437	36	.12	.1	.3	.1	1982	1983-85	1997	1983	1985-87	1999	1983	1986-88	2001
S.California	211	920	37	.7	.3	2.6	1.3	1983	1985-88	1996	1986	1989-90	1998	1987	1990	2000
C&N California	90	465	19	.4	.2	1.6	.9	1984	1986-87	1995	1987	1988-89	1997	1987	1989-90	1999
S. Alaska(Sale Area)	7	26	1	.1	.04	.5	.2	1986	1987	1991	1991	1991	1991	1992	1992-95	1995
N. Aleutian Basin	14	54	2	.2	.1	1.0	.4	1984	1987	1992	1987	1987	1991	1988	1992	1994
St. George Basin	19	78	3	.3	.1	1.5	.6	1984	1986-87	1994	1987	1987-91	1991	1988	1989-90	1994
Navarin Basin	18	114	3	.5	.2	2.2	.9	1985	1988-89	1993	1988	1988	1995	1989	1984	1998
Norton Basin	21	41	3	.2	.1	.8	.3	1984	1986-88	1994	1988	1988	1993	1989	1989-90	1996
Hope Basin *	6	9	1	.1	.02	.2	.1	1986	1988	1990	1990	1990	1990	1991	1991-92	1992
Barrow Arch *	8	47	1	.2	.1	.9	.4	1986	1989	1996	1990	1990	1990	1991	1991-2000	2000
Diapir Field *	45	332	8	1.3	.5	3.0	.8	1984	1986-88	1997	1986	1989-90	1998	1987	1994-96	2008
OCS-Wide **	1562	5152	261	6.5	2.7	24.1	11.2									

* Includes only the portion of the planning area in water depths of 0-100 meters.
** OCS totals must be calculated from total OCS resource estimates and are not column totals.

TABLE III - 6b

ESTIMATED DEVELOPMENT TO RESULT FROM the ADOPTION of Alternative I-1

THE PROPOSED SCHEDULE WITH PLANNING AREA-WIDE OFFERINGS

	N.Atlan.	Mid Atla.	S.Atlan.	E.G.O.M.	C.G.O.M.	W.G.O.M.	S. Calif.	C&N Calif	S. Alaska	N.Aleut.	St.Georg.B	Navarin B.	Norton B.	Hope B.	Barrow Arch	Diapir Fld.	Totals
Number of New Pipelines *																	
Oil	3	3	0	0	0	0	30	15	1	1	1	1	1	0	1	1	69
Gas			1	0	2	2			0	1	1	1	1	0	1	1	
Number of Support Bases																	
New	2	1	1	2	6	3	1	5	1	0	2	2	2	1	2	1	32
Expansions	1	1	2	1	25	20	1	1	0	1	0	2	0	0	0	1	56
Marine Terminals																	
New	0	0	1	1	0	0	0	0	1	0	1	1	1	0	1	0	7
Expansions	0	0	0	0	1	2	0	0	0	1	0	1	1	0	0	1	7
Oil Refineries																	
New	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Expansions	0	0	0	1	6	6	0	0	0	0	0	0	0	0	0	0	13
Gas Processing Plants																	
New	2	2	1	0	2	2	0	0	0	0	1	1	1	0	0	0	12
Expansions	0	0	0	1	12		0	0	0	1	0	0	0	0	0	0	14

* Some pipelines may extend only within the producing field from platform to platform. Some pipelines carry both oil and gas.

TABLE III - 7
QUANTITIES OF EFFLUENTS RELEASED BY OCS
WELL DRILLING
ALTERNATIVE I - 1

Planning Area	Drilling Mud Million bbls	Cuttings Thousand Cu yards	Formation Water Billion bbls over Life of Field
North Atlantic	2.6	474	2.8
Mid-Atlantic	2.1	388	2.3
South Atlantic	1.5	170	1.1
Gulf of Mexico	3.5	120	9.6
S. California	3.39	367	0.07
C & N California	0.291	152	0.14
Gulf of Alaska	0.031	9	0.1
Cook Inlet	0.115	8	0.04
Kodiak	0.013	6.6	0.01
Shumagin	0.024	8	0.01
N. Aleutian Basin	0.04	13	0.6
St. George Basin	0.06	19	0.06
Navarin Basin	0.08	26	0.06
Norton Basin	0.04	12	0.02
Hope Basin	0.009	3	0.005
Barrow Arch	0.001	16	0.8
Diapir Field	0.09	113	0.6
Totals	13.6	1904	18.0

TABLE III - 9
Estimated Development to Result from the Recovery of All Resources Within Each Planning Area for Alternative I-1

Planning Area	Number of Wells: Exploratory	Number of Wells: Development/ Production	Number of Platforms	Number of Oil Spills: Production 1K bbls	Production 10K bbls	Transportation 1K bbls	Transportation 10K bbls	Exploratory Wells: First	Most Intense	Last	Platforms: First	Most Intense	Last	Devlpmt/Prod. Wells: First	Most Intense	Last
North Atlantic	633	2443	98	3.2	1.3	12.8	6.8	1984	1984-87	1997	1990	1991-93	2003	1991	1991-94	2008
Mid Atlantic	470	1878	75	2.1	.9	8.6	4.6	1984	1985-87	1993	1990	1991-93	1999	1991	1991-94	2004
South Atlantic	277	762	30	.9	.4	4.4	2.6	1984	1986-88	1995	1987	1989-90	1998	1988	1989-91	2000
E.G.of Mexico	370	555	22	1	.4	2.4	1.4	1982	1984-86	1997	1985	1987-89	2000	1986	1988-90	2002
C.G.of Mexico	12176	6880	573	2.56	1.04	5.9	1.5	1982	1983-85	1998	1983	1985-87	2001	1983	1986-88	2003
W.G.of Mexico	7924	3845	320	1.2	.5	2.7	.7	1982	1983-85	1998	1983	1985-87	2001	1983	1986-88	2003
S.California	506	1840	74	1.4	.6	5.1	2.5	1983	1985-88	1996	1986	1989-90	1998	1987	1990	2000
C&N California	176	845	34	.7	.3	2.9	1.6	1984	1986-87	1995	1987	1988-89	1997	1987	1989-90	1999
G.of Alaska	12	106	3	.4	.2	2.0	.9	1986	1987-90	1996	1990	1993	1998	1991	1994	2001
Kodiak	24	110	4	.4	.2	2.1	.9	1986	1987-90	1996	1990	1993	1998	1991	1994	2001
Cook Inlet	7	18	1	.1	.0	.3	.1	1986	1987-90	1996	1990	1993	1998	1991	1994	2001
Shumagin	13	36	1	.1	.1	.7	.3	1986	1987-90	1996	1990	1993	1998	1991	1994	2001
N.Aleutian Basin	29	90	3	.7	.3	1.7	.7	1984	1987	1994	1987	1989	1991	1988	1989-90	1994
St. George Basin	40	142	4	.6	.2	2.7	1.2	1984	1986-87	1996	1987	1987-91	1991	1988	1990	1994
Navarin Basin	51	228	7	.9	.4	4.3	1.9	1985	1987-90	1997	1988	1990	1990	1989	1993	2002
Norton Basin	29	54	3	.2	.1	1.0	.4	1984	1986-88	1994	1988	1990	1993	1989	1989-90	1996
Hope Basin *	10	14	1	.1	.02	.3	.1	1986	1988	1990	1990	1990	1990	1991	1991-92	1992
Barrow Arch *	45	188	5	.7	.3	3.5	1.5	1986	1989-91	1996	1988	1990	1997	1989	1994-98	2007
Diapir Field *	94	554	14	2.2	.9	5.0	1.3	1984	1986-88	1997	1986	1989-91	1998	1987	1992-96	2008
OCS Totals **	22,870	19,99[illegible]	1251	17	7	60	27									

* Includes only the portion of the planning area in water depths 0-100 meters.

** OCS totals must be calculated from total OCS resource estimates and are not column totals.

Table III-8
Conditional Mean Estimates of Resources to be Recovered
Assuming all Offered Acreage is Leased

Planning Area	Oil/billion bbls	Gas/Tcf	Transportation	Probability of Economic Success
North Atlantic	4.0	16.7	Tanker/Pipeline	.99
Mid Atlantic (Sale 76)	2.7	11.3	Tanker/Pipeline	.99
South Atlantic	1.1	4.3	Tanker	.84
E. G. of Mexico	1.1	1.4	Pipeline/Tanker	.87
C. G. of Mexico	3.2	34.9	Pipeline	1.00
W. G. of Mexico	1.5	26.3	Pipeline	1.00
S. California	1.8	3.1	Pipeline/Tanker	1.00
C & N California	.9	1.2	Tanker/Pipeline	.99
Gulf of Alaska	.5	3.0	Pipeline/Tanker	.66
Kodiak	.6	3.2	Pipeline/Tanker	.61
Cook Inlet	.1	.7	Pipeline/Tanker	1.00
Shumagin	.2	1.4	Pipeline/Tanker	.43
N. Aleutian Shelf	.5	2.2	Pipeline/Tanker	.42
St. George Basin	.7	3.9	Pipeline/Tanker	.64
Navarin Basin	1.1	7.3	Pipeline/Tanker	.76
Norton Sound	.3	2.2	Pipeline/Tanker	.57
Hope Basin	.1	1.1	Pipeline/Tanker	.24
Barrow Arch	.9	4.2	Pipeline/Tanker	.76
Diapir Field	2.8	14.8	Pipeline	1.00
OCS Total	19.39	120.13		

b. Summary of Environmental Impacts of Alternative I-1.

North Atlantic: The coincidence of potential leasing areas and traditional sea lanes could, if platforms are constructed within the sea lanes, cause high levels of impact resulting in the relocation of routes used by ocean going vessels for many years. Moderate levels of impact to commercial fisheries will occur mainly due to the effects of oilspills and chronic discharges. Fish stocks on Georges Bank and nearshore shellfish populations could be reduced or tainted, causing short-term economic losses to the fishing industry. Air quality, at nonattainment levels throughout much of the area, would suffer moderate levels of impact due to the construction of gas processing plants.

Should oilspills contact a coastal wetlands and beach or dune ecosystems they will cause short-term degradation with possible high mortalities among coastal fish and wildlife species leading to moderate levels of impact with no long-term effects throughout the coastal area. Impacts on Georges Bank and Nantucket Shoals whould also be moderate as oilspills, chronic discharges, and the effects of drill cuttings and muds cause some losses among species whose larva and eggs drift in the area, and among species which live on the bottom, notably lobster and tilefish. Species within the canyon heads would likewise receive short-termed moderate impacts if drilling muds entered the canyons.

Cumulative impacts to coastal ecosystems will be high because of the continued growth of urban and industrial areas along almost the entire coastline of the planning area, aggravated to a minor degree by the effects of OCS related

onshore development such as support bases, pipe yards, and refineries, pipeline landfalls, and oilspill groundings. Most severely affected will be wetlands areas near ports, which may be altered by landfilling. The combination of oilspills and chronic discharges, platform placement, increased marine traffic, and injuries caused by fishing activities will cause habitat degration and possible long-term interference with the existance of sea turtle and whale populations, causing high levels of impact to these endangered species. Air quality onshore will receive high levels of impact because pollutants will be introduced into non-attainment areas around any new gas proessing facilities constructed as a result of OCS operations.

County level socioeconomic impacts would be caused by an infusion of population, jobs, and money into any county in which support bases or gas processing facilities are located. Such growth from OCS related activity is expected to be only a small part of the overall economic change in any such area.

Mid-Atlantic: Leasing tracts within, or near heavily travelled shipping lanes, with the resultant construction of platforms, and an increase in tanker traffic to refineries in the New York and Philadelphia areas, would cause the only high impact levels in this area, resulting in the need to reroute vessel traffic. Due to heavy use of the area by other activities, moderate impacts to other uses of the OCS will occur as some dumping sites may have to be relocated. The military operating areas of Narragansett Bay, Atlantic City, Patuxent River and Virginia Capes could have certain execises curtailed or otherwise adversely affected, and NASA activities at Wallops Island could be affected if oil and gas related operations took place in impact areas. Commercial fisheries would receive moderate levels of impact partly due to displacement of fishing area by platforms and pipeline construction, but mainly through the effects of oilspills and chronic discharges, which would cause temporary reductions of fish stocks. Recreation, expecially beach oriented activity, would receive moderate impacts resulting in the partial closure of sections of beach along the south shore of Long Island or along the coastline in New Jersey, Delaware, Maryland or Virginia.

South Atlantic: Cultural resources will receive moderate levels of adverse impact because of the density of historic and archaeological resources in the planning area and the probability that damage to some will be caused by oil and gas related bottom disturbance such as anchoring and rig placement. Coastal recreation will receive low to moderate levels of impact by the closure of some water oriented facilities, such as beaches, soiled by spilled oil reaching shore. Coastal ecosystems will be moderately affected by oilspills contacting marshes, estuaries, and mangroves, causing short-termed interference with ecological processes, and substantial losses to some species. Construction of support bases and other onshore facilities would cause additional, long-termed but isolated damage to coastal ecosystems. Commercial fisheries would receive moderate impacts, mainly by the effect of an oilspill on fish stocks if breeding grounds along the coast are oiled, or if offshore fishing grounds are affected by a spill during fishing seasons.

Cumulative impacts on cultural resources from oil and gas activity combined with all other activity in the area will be high, although the contribution of oil and gas activity to the total is expected to be minor. Industrial growth along the coastline, causing expansions of ports and increases in effluents

will cause high levels of impact on coastal ecosystems, as some marshes and estuaries are stressed beyond their ability to recover. Commercial fisheries would experience moderate to high levels of impact as the effects of oil and gas related activity, such as platform construction in fishing grounds, and oilspills, combined to reduce fishing area and reduce fish stocks.

Eastern Gulf of Mexico: Military operating areas would experience high levels of impact if oil and gas operations task place within their boundaries. Moderate levels of impact to coastal ecosystems (marshes, bays, lagoons and estuaries) are expected to occur due to the effects of oilspills and the burial of pipelines; however, both would cause only short-termed impacts. Recreation is expected to receive high levels of impact mainly as a result of the short-termed closure of water oriented activity following an oilspill incident. Cultural resources will receive moderate levels of impact from bottom disturbance such as anchoring. Commercial fisheries will receive moderate levels of impact on a short-term basis, from the effects of oilspills contacting coastal breeding grounds and nursery areas in estuaries, marshes, and bays.

Cumulative impacts on coastal ecosystems will be high when the effects of OCS related activity, such as oilspills and support base contruction, are added to the expected growth from other industries along the coast. Some species or ecosystems in areas near rapidly growing ports or coastal areas will sustain long-term interference and ecological change. Habitats of special concern, mainly live bottom areas, could sustain high levels of impact from all causes, but oil and gas related impacts are not expected to make a significant contribution. Impacts on commercial fish resources will be moderate to high because of the alteration, by all activities, of coastal breeding and nursery grounds in marshes, estuaries, and bays.

Central Gulf of Mexico: Air quality is expected to receive moderate levels of impact due to the number of gas processing plants projected in non-attainment areas. Coastal ecosystems would receive moderate levels of impact from oilspills, and up to two pipeline landfalls. Except for erosion in pipeline trenches, ecological interference should be short termed. Biotic communities located on topographic highs along the continental shelf break will also receive short-term interference if wells or platforms are placed within their confines. Oilspills would cause moderate impacts to commercial fisheries if coastal breeding and nursery areas are affected, and important fishing areas are closed during the harvest season. Temporary closure of some shoreline recreational activities due to the grounding of any of the expected oilspills would cause moderate impacts to recreation.

Cumulative impacts on air quality will be high when increased oil and gas development in the form of nearshore platforms, and new or expanded gas processing facilities are combined with other forms of industrial growth along the Gulf Coast, although the contribution of OCS activity is expected to be minor. Coastal ecosystems will also suffer high levels of impact, mainly in the form of wetland loss through erosion of marsh canals and pipeline trenches, and from the effects of oilspills on wetlands biota. Live bottom areas will also suffer high levels of impact if operations are allowed on them, and drilling muds and cuttings settle on the organisms, or physical disturbance, such as anchoring, takes place.

Western Gulf of Mexico: The possibility of two new gas processing plants in the area will have moderate levels of impact on air quality, since much of the Gulf Coast is in nonattainment status. Short-term, moderate impacts to coastal ecosystems will occur as oilspills contact marshes, bays, or lagoons, and pipeline trenching, or onshore facility contruction takes place. Commercial fishing would receive moderate impacts from the adoption of this schedule because of oilspills closing fishing grounds, or due to spills contaminating wetland breeding or nursery grounds in marshes and bays. Economic losses to fishermen would be short-termed and localized. It can be expected that at least one major oilspill will affect shorefront recreational activity by causing the partial closure of some beaches for short periods of time.

Cumulative impacts to air quality will be high as the Gulf Coast continues to industrialize. OCS-related impacts will probably be highest in coastal refining centers currently in a non-attainment status such as the Houston-Texas City, Texas, and Lake Charles, Louisiana area because of the need for additional or expanded gas processing facilities. Coastal wetlands will suffer reductions in area due to non OCS-related drainage and construction projects, and urbanization, aggravated by OCS related pipeline and support base construction. Oilspills repeatedly contacting wetlands biota will add to the cumulative effects, and impact levels on coastal ecosystems will be high. The continued reduction in breeding and nursery areas, as coastal wetlands are reduced in size, will cause moderate to high impacts on commercial fishermen as fish resources are reduced in number or variety. Because of the large amount of bottom disturbance expected from OCS operations and all other activities, cultural resources will experience the loss of a few historic or prehistoric sites.

Southern California: The impact of the proposal on water supply is expected to be high due to increased demand on already dwindling supplies. Moderate impacts to marine traffic in the region can be expected, due to increased shipping activity, expecially in the Santa Barbara Channel. Overall, impacts to military activity should be moderate, except in the Santa Barbara Channel where, although there is high industry interest, there is little military activity.

In the southern California region, impacts from the proposal on intertidal areas is expected to be low to moderate; however, there is a possibility of high ecological loss at some localized, unusual island habitats and small, isolated mainland habitats. The expected overall impact to subtidal benthos communities is also low to moderate, with possibly moderate to high ecological loss to hard bottom communities in the immediate vicinity of platforms. Although impact to wetlands could be high to very high if an oilspill should reach them, given the relatively low probability of this event occurring, the impact to this resource regionally is considered moderate.

Trawl fishing in the Santa Barbara Channel could experience high economic loss due to loss of fishing space resulting from platform and pipeline placement, and the crab fishery may experience temporary moderate to high economic loss. Any losses to the fisheries should be short-term, and some fishermen can switch temporarily to other fisheries. Regionally, the expected impacts to commercial fisheries are expected to be moderate.

Endangered whales are expected to sustain a moderate impact from the proposal due to possible oilspills and noise associated with OCS activities. It is unlikely that other endangered species in the area would be affected. The expected regional impact from this proposal is moderate.

There is an expected moderate impact of this proposal on seabird, pinniped, intertidal, and subtidal benthos resources in the Channel Islands Marine Sanctuary, although there is a potential for high ecological loss. Other activities and resources in the sanctuary may suffer minor interference. Overall, the impact is expected to be moderate. The expected impact on marine mammals in the area is expected to be moderate, since whales may sustain moderate ecological losses while other marine mammals are expected to sustain low ecological impacts. The expected regional impacts to seabirds are moderate, with nesting seabirds expected to sustain moderate to high losses, and migratory seabirds expected to sustain low to moderate losses.

While the impact to coastal recreation in the immediate area where an oilspill may contact the shore would be very high, the overall regional impacts from activities resulting from this proposal on coastal activites are expected to be moderate. Similarly, in an area where an oilspill may occur, or where platforms may be concentrated, visual impacts may be very high, but regionally the impacts are expected to be moderate.

Cumulative Impacts. Cumulative impacts on water quality in the region are expected to be moderate. Possible oilspills, drill muds, and cuttings, formation waters, and sewage disposal resulting from this proposal are minor contributors to the overall water quality impact compared to existing non-OCS related contributors. The expected cumulative impact on water supply is very high, ongoing non-OCS-related population growth being the major contributor. Additional water supply required by this proposal would be a relatively minor contributor to this impact.

The contribution of this proposal to the cumulative impact on ports and harbors is relatively small although, it will cause some increase shipping activity by tankers, barges, supply and crew boats. Overall, the cumulative impact to ports and harbors is expected to be moderate, due primarily to increased commerce in the region. The expected cumulative impact on marine traffic is high, the platforms, and shipping traffic, from the proposal being significant contributors, in addition to impacts caused by State Tidelands development, and other non-OCS-related commerce.

Expected cumulative impacts on military activity are moderate to high, impacts from this proposal being substantial in addition to impacts from eventual total development of OCS resources and non-OCS related activity.

The cumulative impact to onshore and offshore cultural resources is expected to be moderate. Impacts from this proposal would be a small but significant contributor to cumulative impacts offshore, along with State Tidelands development, labor expansion, and ocean dumping. Activities resulting from this proposal would be a minor contributor to cumulative impacts on onshore cultural resources which are already heavily effected.

Cumulative impacts to intertidal and subtidal benthos communities are expected to be moderate to high, due to oilspills contacting rocky or sandy intertidal

zones, and platform and pipeline placement. The contribution of the proposal is low to moderate for intertidal areas for subtidal impacts, and the contribution of platforms resulting from the proposal in the Santa Barbara Channel is significant. The cumulative impact on wetlands is expected to be high. The contribution of the proposal is relatively minor when compared to oil spill probabilities from non-OCS tankering.

Many commercial fish populations in the area are already stressed. Given that fact, cumulative impacts on fish are expected to be high, with the activities resulting from the proposal making a relatively minor contribution. The cumulative impact to the commercial fishing industry is also expected to be high. The contribution of the proposal to this impact will be relatively small, but significant, since the industry is heavily impacted by other causes.

Cumulative impacts on endangered species are expected to be very high due primarily to impacts resulting from non-OCS-related oilspills and urbanization. The proposal could contribute to a moderate incrase in impacts on whales due to platform placement.

Cumulative impacts to the Channel Islands Marine Sanctuary, and designated areas of special concern, are expected to be moderate to high, due primarily to impacts from oilspills. Relatively few of the total expected oilspills will result from this proposal, which will make a low to moderate contribution to these cumulative impacts. Cumulative impacts to marine and seabirds are expected to be moderate.

The cumulative impact on air quality is expected to be moderate. In general, the proposal will contribute moderately to regional air quality impacts, but may have a high contribution in localized areas.

Cumulative impacts on coastal recreation and visual resources is expected to be moderate. The proposal would contribute moderately to impacts on coastal recreation and substantially to impacts on visual resources, due to platform placement and the probability of oilspills.

The cumulative impacts on population and demography, employment, and public services and facilities, is expected to be high. The contribution of the proposal would be low for these impact categories except in some localized areas such as Santa Barbara where there may be some significant effect.

Central and Northern California: Impacts on water supply from the proposed schedule would be moderate, due primarily to the possible need for improvement and expansion of water systems to accommodate OCS facilities and related population increases. Impacts to ports and harbors could be moderate to high, resulting from OCS tankers, barges, crew and supply boats competing for limited space and facilities in the region's ports and harbors.

Impacts to coastal ecosystems such as intertidal, subtidal, and wetlands areas are expected to be low to moderate. Impact-producing factors in these areas would be oilspills, installation of pipelines, and deposition of drill cuttings and muds.

Impacts on commercial fish species in the region could result from oilspills or the dumping of muds and cuttings. Salmon and other anadromous species could

sustain a high ecological loss. In general, impacts are expected to be low since impacts should be restricted to a few species while most species remain unaffected. Overall, impacts to commercial fisheries in the region are expected to be moderate. The salmon fishery could sustain low to moderate economic losses for five years or more, the trawling industry may sustain moderate to high losses due to loss of fishing space because of platform spacing and pipeline laying activities, and the crab fishing industry may sustain short-term moderate to high economic losses due to loss of gear or fishing space.

Impacts to endangered species in the region are expected to be low to moderate. Whales are likely to sustain low to moderate ecological impacts, while, although unlikely, the least tern and the California clapper rail could sustain high ecological losses. Overall, the impact to threatened species in the region is expected to be moderate. The southern sea otter can be expected to suffer high localized impacts during the life of the proposal.

Impacts to coastal recreation, in general, are expected to be moderate, except in the event an oilspill should contact a recreation area, in which case the local impact would be high. Overall, the impact on visual resources is expected to be moderate except in the localized areas where platforms may be concentrated or where an oilspill may come ashore.

Cumulative Impacts: The proposal substantially contributes to the cumulative impact on water quality resulting from oilspills, drill muds and cuttings, and formation water, but does not contribute substantially to water quality impacts due to population growth and associated sewage discharge. Overall, the cumulative impacts on water supply are expected to be high, although the contribution of the proposal to these impacts is relatively insignificant compared to non-OCS-related regional population growth.

The cumulative impact on ports and harbors is expected to be high. Increased shipping activity resulting from this proposal would be a major contributor.

The cumulative impact on intertidal communities is moderate, the proposal contributing a minor portion of this impact. The cumulative impacts on subtidal benthos are expected to be moderate (or high if multiple platforms are concentrated on sensitive reef or hard bottom areas). Cumulative impacts on wetlands are expected to be moderate, although the proposal would contribute a minor portion of this impact.

Cumulative impacts to commercial fish species are expected to be high due to possible oilspills resulting from existing tankered imports, and OCS drilling, overfishing, and sewage disposal. Although the proposal would contribute a minor portion of this impact, even this small increase would be considered significant, since fish populations are already stressed. Cumulative impacts to the commercial fishing industry are also expected to be high. Again, although the proposal would contribute a minor portion of the impacts, this small increase would be significant due to the current and expected stress on the industry from other causes.

Cumulative impacts on endangered species are expected to be high, although the proposal would contribute a minor portion of this impact. In the cumulative case, a potential exists for a high ecological loss to the threatened sea

otter. The contribution of the proposal to the overall expected high impact to this threatened species is considered to be low.

From a regional perspective, designated areas of special concern could receive moderate cumulative impacts, the possibility of an oilspill contacting the sea otter population being the major factor.

The overall, cumulative air quality impacts are expected to be moderate. The contribution of this proposal is expected to be low, generally, but if platforms are concentrated, or barging and tankering occur, localized impact would be high in some areas.

Gulf of Alaska: The proposal is expected to have impact levels up to moderate on whales, other marine mammals, and seabirds. Since the area is a critical feeding habitat for seven endangered whale species, impacts will be moderate, even though the chance for oilspills is small, and the level of oil and gas activity is expected to be low. Oilspills will likewise cause moderate impacts to seabirds since the area is impacted to them, and the are extremely sensitive to contact with spilled oil. Noise from airborne and underwater activity and oilspills could also cause moderate impacts on marine mammals such as fur seals, sea lion, and walrus.

Cumulative: Water supply requirements will cause high impact levels as new shore based facilities are developed, and as offshore operational demands expand. Local facilities would be incapable of satisfying industry demands so new supplies will have to be developed. Since most of the coastline is undeveloped, land use impacts will be high as any expansion of support bases or new construction will call for the change of undeveloped land into industrial land. Oilspills affecting food resources, oil and gas industry activity and other activity along the coastal areas will combine to cause moderate to high impacts to native subsistence cultures.

Oilspills contacting coastal ecosystems, such as seabird nesting colonies, seal rookeries and pupping grounds, and whale and seal feeding areas in Prince William Sound will cause moderate to high impact levels when tankering from the sound is combined with OCS activity. Oiling of seabird and marine mammal habitats along the coast will, if oiling incidents are two frequent, lead to moderate to high levels of impact. Whales will also suffer the same levels of impact from oilspills and OCS related activity, combined with tankering, commercial fishing and commercial shipping activity through the area. Commercial fishing will experience moderate levels of impact as oil spilled from tankering and from OCS activities reduces fish resources in quantity or variety.

Cook Inlet: Because of the confined nature of the inlet, oilspills and other oil and gas related disturbance will have moderate to high impacts on the large local populations of seabirds and marine mammals such as sea otters. Heavier population than most other Alaskan areas, combined with the confined character of the inlet will likewise cause moderate impacts to tourism and recreation becaus any oil and gas activity onshore or offshore will intrude upon the wilderness character of the area, one of its main attractions. Oilspills affecting food resources such as salmon and seal will cause moderate impacts to local subsistence cultures.

Cumulative impacts on Cook Inlet seabirds and their habitats could reach high levels as the effects of a combination of commercial fishing activity, transportation (and spilling) of oil, an oil and gas exploratory and developmental activity. Marine mammals in the inlet will receive moderate to high impacts from the same combination of activities. The disruption of food resources would in turn have moderate impacts on native subsistence cultures. Increased growth in the upper Inlet area (Anchorage) will cause high levels of impact by introducing short-term stress on public and private services. Water supply facilities and causing high impact levels.

The combined activity of Federal OCS leasing and State leasing and development will have moderate impacts on commercial fish resources and hence, the industry. Oilspills, chronic discharges and fishing pressure could combine to cause loss to certain commercial species such as pink salmon and herring.

Kodiak: Marine mammals and seabirds, both present in very large numbers in this ara, would receive moderate to high impacts from oilspills. Since few water supply facilities are present, industry would require new sources, causing moderate impacts, although industry would probably provide its own sources, not causing impacts to local urban supplies. Local land use conflicts with established communities will be low, but impacts where enclaves are constructed may reach moderate levels as undeveloped land is changed to industrial use. Cultural resources near enclaves could be subject to visits from oilfield workers, causing moderate local scale impacts.

Cumulative impacts to water supplies will be high when OCS activity is combined with expansion of other activities such as bottomfishing (and processing of the catch), and expansion of the population. Continued growth in the area will also contribute to high land use impacts as local communities expand, and oilfield support bases are needed, altering undeveloped land into the industrial and developed state. Endangered whales, marine mammals and seabirds could all receive moderate to high leves of impacts mainly through the effects of oilspill events from OCS operations tankering, State lease sale activity, and commercial fishing. Finally any increase in activity in the area, accompained by construction along the coast, offshore activity and additional air and sea traffic, could have moderate impacts on recreation and tourism as individuals seeking a wilderness type experience are forced to go elsewhere.

Shumagin: The requirement for new water supplies in the Shumagin area will cause moderate impacts, although local facilities should not be affected. The combination of tankering through the area, and possible oil and gas activity, would have moderate impacts to endangered birds and marine mammals, especially whales, as the area is an important breeding, feeding, and migration area.

Cumulative impacts to water quality would be very high when the effects of OCS activities are combined with the effects of tanker spills, chronic discharges from platforms, and drill cuttings. Endangered species, especially whales, will experience moderate to high levels of disturbance from tankering, seismic testing, sonic discharges, and commercial marine traffic. Native subsistence cultures will suffer moderate to high impacts as oil and gas activity is combined with onshore leasing, fisheries development, and oilspills from tankering. These activities could combine to reduce food resources and disrupt traditional lifestyles and cultural linkages.

Oilspills from OCS activities, State leasing, and tankering will constitute a moderate threat to coastal ecosystems. Oilspills from the proposal, and from tankering, competition for port space, and competition for labor will cause moderate impacts to the commercial fishing industry through loss of fish resources, gear loss and, loss of individuals who join the oil and gas labor pool.

North Aleutian Basin: Impacts on water supply systems are expected to be high due to the need to develop new systems.

Impacts on the endangered gray whale from this proposal are expected to be moderate as a result of possible disturbances or oilspills occurring in the migratory path of the whales.

Due to the possibility of man-made disturbances and oilspills resulting from this proposal and the importance of this area to seabirds and waterfowl and numerous marine mammals the impact of the proposal on these habitats and resources are expected to be moderate. Impacts on fish and fisheries will be low.

Impacts on native subsistence culture are expected to be moderate to high due to the vulnerability of village socio-cultural systems to real or preceived effects of offshore operations.

Cumulative Impacts. Cumulative impacts to coastal ecosystems are expected to be high. The primary impact producing factor is tankering from other areas, while the proposal makes a relatively minor contribution to the overall impact.

Cumulative impacts to water supply systems are expected to be very high, with the proposal making a small contribution to the total impact.

Cumulative impacts to endangered whales in the planning area are expected to be moderate to high given the potential for oilspills and man-made disturbance in the magratory path of the gray whale. The primary causal agent for impact to the whales is tankering from other Federal lease sales.

Habitats and resources of special concern primarily seabirds, are also expected to receive moderate to high cumulative impact. The most important causal agent, again, is tankering from other areas.

Potential cumulative impacts on socioeconomic factors are expected to be very high, due to significant long-term stress on public and private services and facilities resulting from increased resident employment and population. The largest impact will be from non-OCS sources, but OCS-related impacts would be significant.

Cumulative impacts to native subsistence culture are expected to be moderate to high. The most important causal agent to cumulative impacts on subsistence cultures is tankering of oil from other OCS areas. The contribution of the proposal in this planning area to the overall cumulative impact is marginal.

St. George Basin: Coastal ecosystems are expected to be moderately impacted by this proposal. Potentially affected areas include the Pribilof Islands seal and seabird habitat (oilspills and noise), Pribilof Islands and Alaska Peninsula intertidal waters, crab and finfish habitat (oilspills), marine

mammal and sea otters in Unimak Pass (oilspills and noise) and whiskered auklet habitat in the eastern Aleutian Islands (oilspills and noise).

Land use impacts are expected to be moderate to high since any onshore development in the area would probably be sited on the south side of the Alaska Peninsula, where no land use plan exists.

In general, endangered whales can be expected to be moderately impacted by the proposal, with the gray whale being potentially the most vulnerable species. Also, habitats and resources of special concern could be moderately impacted. The northern fur seal and diving seabird habitats are the must vulnerable.

Impacts on village subsistence cultures are expected to be moderate to high, primarily in Nikolski and the Pribilof Islands, due to potential effects on fur seal habitat and possible closure or degradetion of commercial or subsistence harvest.

Cumulative Impacts. In general, the cumulative impact on water quality in the area is expected to be moderate, the largest potential impact producing factor being oil pollution. Cumulative impacts on water supply systems can be expected to be high if all OCS oil and gas resources are eventually developed in addition to expansion of commercial fisheries, and general commercial growth.

Cumulative land use impacts are expected to be moderate to high due to possible increased population pressures and scarce developable land.

Cumulative impacts to commercial fish species are expected to be moderate due to potential oilspills primarily from increased tanker traffic and to expansion of commercial fishing efforts. Moderate cumulative impacts, therefore, are also expected for the commercial fishing industry.

In general, cumulative impacts to endangered whales is expected to be moderate to high. The greatest potential cause of impacts would be potential spills from tankering from other OCS planning areas.

Cumulative impacts, primarily from oilspills, on habitats of special concern (fur sea, diving seabirds) are expected to be high.

Cumulative impacts to native subsistence cultures, in gereral, are expected to be moderate to high, a major factor being the effect of potential oilspills due to increased tanker traffic through the area.

Nararin Basin: Impacts on water quality will be moderate as drilling effluents and chronic discharges, coupled with possible oilspills, occur in the area. If St. Matthew Island is used for a supply and support facility, land use impacts will be very high since land will have to be changed from an essentially wilderness to an industrial state. Oilspills and noise disturbance from OCS operations could have moderate adverse effects on whales since the area is an important overwintering area. Bearded and ribbon seal pups, and diving seabirds are expecially susceptable to oilspills and could also suffer moderate impacts from oil and gas operations.

Cumulative effects on land use will remain very high as subsequent schedules and sales in the planning area call for expanded or additional support facilities on St. Matthew Island. The combination of OCS operations and tankering will cause moderate to high impacts to whales, seabirds and other marine mammals from the oilspills possibly resulting from all activities.

St. Mattehw-Hall: No sales are proposed in this planning area, therefore direct impacts resulting from this proposal would not take place. Tankering from OCS areas further north, and the Canadian Beaufort could result in oilspills within this planning area but impacts to all resources are expected to be very low or non-existant. Land use impacts would be moderate if undeveloped land on St. Matthew Island was to be made into a support base for operations in the Navarin Basin.

Norton Basin: The lack of local water supply facilities sufficient to supply industry's needs means that new supplies will have to be sought out and developed, causing high levels of impact. Large numbers of nesting seabirds and marine mammals reside in habitats of special concern within the basin. These are especially susceptable to damage from oilspills, with resultant loss of wildlife, causing moderate levels of impact. The reduction of food resources and conflicts caused by contacts with oilfieled activity will cause moderate impacts to local native subsistence cultures.

Cumualtive impacts on water supplies would be high because of the lack of well developed supplies, while impacts on water quality would be moderate due to oilspills and chronic discharges from OCS and State leasing. The habitats of seabirds and marine mammals, expecially those nearest the Bering Straits would suffer moderate to high impact levels due to the combined effects of OCS operations and tankering form Federal and Canadian leases in the Arctic. Endangered whales species would also be subjected to oilspill incidents and increased human activity, causing moderate to high impacts. Spills reaching coastal areas could have locally high impacts on sensitive coastal ecosystems such as the Yukon Delta, and in combination with other OCS activity, plus State leasing, impacts would be moderate to high.

Native subsistence cultures will not only be submitted to increased outside activity, straining traditional customs, and reducing subsistence food resources, but increased activity will mean more pull away from traditional means of livelihood for younger society members, all combining to cause moderate to high cumulative impacts. Finally, oilspills from OCS activites, State leasing and tankering through the Basin could cause reductions in the populations of some fish and shellfish populations, causing moderate impacts on commercial fishermen.

Hope Basin: Impacts to most resource categories in the Hope Basin as a result of the proposal are expected to be very low to low-to-moderate. The exceptions are potential impacts to water supply systems and potential impacts to endangered species, habitats of special concern and land use.

Potential impact to water supply systems is exected to be very high since any new requirement for water would require building of new supply systems. Impacts to endangered whales is expected to be moderate due to possible oilspills and noise disturbance while expected moderate impact to peregrine falcons would be due to possible from aircraft noise and disturbance.

Potential impacts to marine mammals and birds and their habitats of special concern are expected to suffer moderate impacts from possible oilspills and disturbance from seismic activities. New support facilities would require the change of some land from and undeveloped, possibly near wilderness character to industrial use, causing moderate to high impact levels.

Cumulative Impacts. Cumulative impacts to water quality are expected to be moderate due to possible spills from tankering, discharges of formation waters, and construction of gravel islands. Cumulative impacts to water supply are expected to be high due to the need to construct new water supply systems.

Endangered whales are expected to suffer moderate to high impacts from oilspills and distrubance which may result from increased production and tankering activity in the planning area. Cumulative impacts to marine mammals and and birds and their habitats are expected to be moderate to high, resulting from disturbance associated with seismic activities and possible oilspills.

The Native subsistence culture is expected to sustain moderate cumulative impact, due to possible oilspill impacts on bowhead whales resulting from tankering. Land use impacts would be moderate to high as OCS operations continued to require more land to be devoted to expansion and construction of support bases.

Barrow Arch: Inupiat subsistence cultures in the ara would receive high to very high impact levels due to the effects of oilspills and other OCS related disturbance to subsistence food resources such as the bowhead whale, and contacts with increasing numbers of outside individuals and groups. One of the food sources of the Inupiat (and endangered species) the bowhead and gray whales, could receive high impact levels, due to oilspills and noise disturbance. Nesting seabird habitats, ringed, bearded and spotted seal haul outs, breeding and feeding areas, and polar bear habitats are all subject to moderate to high levels of impact from oilspills, seismic testing and other oil and gas related activity.

Cumulative effects on subsistence cultures will be high to very high due to the combined effects of OCS operations and related oilspills, onshore development, and possible oilspills from tankers transiting the area from the Canadian Beaufort. Moderate to high impacts to cetaceans (gray and bowhead whales), would also occur, mainly from the action of vessel traffic and oilspills, both from OCS operations and from tankering from Canada. Onshore activity could disturb endangered bird species habitats causing moderate to high impacts to coastal habitats of seabirds, waterfowl, seals, and walrus.

Diapir Field: Native subsistence communities will receive high to very high impacts as the local culture is already stressed by the influx of new activity and culture into the area, and by incrased levels of disturbance to local subsistence food supplies such as the bowhead whale. Endangered species, such as the gray and bowhead whales and peregrine falcon, will be most susceptable to oilspills and disturbance from boat and air traffic, receiving high levels of impact. Oilspills and human disturbance will likewise cause moderate to high levels of impact to ringed seal, migratory waterfowl and seabird habitats, principally in lagoons and river deltas. Finally, impacts on water quality and supply will be mostly in the form of degradation in quality due to oilspills

and chronic discharges, and because of the need for large quantities of fresh water by the oil and gas industry. Water supply impacts will be high.

Cumulative: Native subsistence cultures will be very highly impacted as expansion of the Prudhoe Bay complex, leasing in NPR-4, leasing in State waters, and OCS operations, combine to disrupt access to subsistence resources and increase cultural stress in Inupiat communities. Endangered whales (bowhead and gray), caribou birds and habitats critical to marine mammals, waterfowl, and seabirds will all receive moderate to high levels of impact due to the increased activity on the OCS, in State waters and on the North Slope. Coastal ecosystems would suffer high levels of impact from possible oilspills, and human activity associated with the combined minerals undertakings in the area. Additional shore facilities needed for both on and offshore operations will require the change of currently undeveloped land into the industrial State, causing high levels of impact. Another consequence of this building and expansion of facilities would be to cause moderate to high levels of impact on water quality and water supply. Caribou herds will decline.

2. Alternative I, option 2. The Proposed Schedule, Offering Only Geologically Favorable Acreage

a. Description of Alternative I, Option 2.

1) <u>The Schedule</u>

This alternative employs the same five year leasing schedule as the Proposal. No sales would be dropped or added, nor any sale dates changed. In addition, the streamlining proposal would be retained.

2) <u>Offering Only Areas of Hydrocarbon Potential (Geologically Favorable Acreage)</u>

The planning process would work under this system as follows:

- When the 5-year program is completed, DOI would announce that entire planning areas are available for consideration.

- Prior to the Call for Information, DOI would identify the portions of a planning area which it believes have potential for discovery of commercial deposits of oil and gas, and the identified portions would be announced in the Call.

- The sale process would begin with the issuance of the Call for Information. The entire planning area would be open for consideration at this point, and the call would request information about the entire area.

- In response to the Call for Information, industry, States, and other parties could suggest further areas of potential interest within or beyond those identified by DOI. At the time of the Call, States and others would also have an opportunity to comment on areas or topics of concern which should be considered in the planning for the lease sale. In regard to this last point, States and others would continue

to have the same opportunity to comment on environmental, ocean use, or other areas of interest or concern as they have in the past.

- Using the responses to the Call and other available data, the Under Secretary would approve the areas of hydrocarbon potential to be analyzed in the EIS. This approval will identify the area proposed for leasing (the proposed action) and would represent the Area Identification step listed on the Leasing Schedule.

- The analysis in the EIS would focus on the potential environmental effects of oil and gas activities in the area proposed for leasing. The EIS would also, as in the past, analyze alternatives to the proposed action. Finally, it would include an environmental description of the entire planning area in order to provide the best available information for decisionmaking.

- The proposed Notice of Sale would include the area defined at the Area Identification step and studied in the EIS, subject to appropriate consultation and consideration as called for by the National Environmental Policy Act and the OCS Lands Act.

This option would serve the purpose of allowing a substantial increase in the acreage available to industry over the present leasing system, but it would limit the areal extent of leasing to only those areas considered promising at the time of Area Identification. By limiting the extent of leasing in this manner, environmental studies and analysis could concentrate on areas with potential for ooil and gas development. Less detailed analysis would extend far beyond those bounds, and cover the entire planning area, in order to examine the total area possibly affected by impacts in such a mobile ecosystem as the ocean. Under these circumstances, impact analysis would not be significantly different from examinations prepared for area-wide offerings as proposed in Alternative I-1.

The principal difference between this option and the full planning area offering option would be to focus analysis in the EIS on areas which the Department of the Interior, energy firms and others believe have the geologic potential for producing hydrocarbons. Once the areas of high geologic potential are recognized in the Area Identification step, industry, States, and environmental impact analysts will be able to focus their attention on those areas.

3) <u>Summary of Activities Resulting from this Option to Alternative I</u>

Resource Estimates: Under either option (area-wide, or areas of hydrocarbon potential) of Alternative I, more acreage will be offered than industry is likely to lease and develop. Therefore, the locations of tracts leased in either case will probably be the best of the most favorable tracts, and the amounts of OCS acreage leased would be the same. The resource estimates provided for this option are therefore the same as those provided for the planning area-wide option (Alternative I-1) in Table III-5. In addition, the expectation is that the same tracts, acreage amounts, and resources will be leased as in Option I, and the estimates of development will also be the same as those presented in Table III-6.

4) Summary of Activities Resulting from Development of all Resources Within the Planning Areas

The resources recovered, and the development resulting from total resource recovery would be the same as predicted for Option I total recovery, and presented in Tables III-8 and III-9.

b) Summary of Environmental Impacts of Alternative I-2.

The levels of impact expected from the adoption of this alternative would be the same, or nearly the same, as those expected under Alternative I-1. Since the same levels of development are expected under this alternative as under Alternative I-1, cumulative impacts would reach the same levels.

B. Alternative II: The Draft Schedule of April 1981

1. Description of Alternative II

a. The Schedule

This alternative was the proposed action of the DSEIS, and consisted of a draft proposed 5-year leasing program, which was released April 1981. This schedule consisted of 42 sales, in 16 areas of the OCS, between January 1982 and December 1986 (see Figure III-5).

The principal differences between the two schedules are:

Reoffering Sales: Alternative II proposes to hold five reoffering sales, rather than only one as in Alternative I. These sales would permit industry to lease acreage offered, but not leased, during the prior year. The main reason for these reofferings would be to allow industry to obtain additional acreage in areas where no sale was planned in the near future. For instance, RS-4 would allow tracts not leased in the Sale 83, in 1983 (Navarin Basin), to be leased in 1984, as no further sales are on the schedule in that area.

Gulf of Mexico: The Gulf of Mexico is treated as one planning area. The entire Gulf would be subject to one Call for Information each year, but the area identified as a result would be divided into the two scheduled sales, meaning that all unleased parts of the Gulf would be offered once per year.

California: After 1984, sales offshore California are designated as simply "California," rather than "Central and Northern California," or "Southern California." These designations may require some change in light of the opinion in State of California, et al., v. Watt, No. 80-1894 (D.C. Cir. October 6, 1981).

Alaska: The same number of sales are scheduled in this alternative as in the proposal, in slightly different order and timing. This schedule offers only one sale in the Navarin Basin, instead of two, and a sale would be scheduled in the St. Matthew-Hall planning area, to permit industry the option of exploring that part of the Bering Sea.

ALTERNATIVE II

DRAFT PROPOSED 5-YEAR OCS OIL AND GAS LEASING SCHEDULE

U.S. DEPARTMENT OF THE INTERIOR

April 1981

SALE AREA	Proposed Date	Schedule (1982–1986, in order)
7 Gulf of Mexico	2/82	N S
8 S. California	4/82	G R N S
57 Norton Basin	5/82	F P G R N S
RS-2	6/82	P G R N S
52 North Atlantic	8/82	F P G R N S
71 Diapir Field	10/82	E H F P G R N S
69 Gulf of Mexico	11/82	P G R N S
70 St. George Basin	12/82	H F P G R N S
73 California	1/83	E H F P G R N S
76 Mid Atlantic	2/83	E H F P G R N S
75 N. Aleutian Basin	4/83	E H F P G R N S
72 Gulf of Mexico	5/83	E H F P G R N S
RS-3	6/83	P G R N S
78 So. Atlantic	7/83	E H F P G R N S
74 Gulf of Mexico	11/83	E H F P G R N S
83 Navarin Basin	12/83	C D A E H F P G R N S
80 California	1/84	C D A E H F P G R N S
82 N. Atlantic	2/84	C D A E H F P G R N S
87 Diapir Field	3/84	C D A E H F P G R N S
79 Gulf of Mexico	4/84	C D A E H F P G R N S
88 Norton Basin	6/84	C D A E H F P G R N S
RS-4	7/84	P G R N S
89 St George Basin	10/84	C D A E H F P G R N S
81 Gulf of Mexico	11/84	C D A E H F P G R N S
85 Barrow Arch	1/85	C D A E H F P G R N S
90 Atlantic	2/85	C D A E H F P G R N S
91 California	3/85	C D A E H F P G R N S
84 Gulf of Mexico	4/85	C D A E H F P G R N S
RS-5	5/85	P G R N S
92 N. Aleutian Basin	6/85	C D A E H F P G R N S
86 Hope Basin	7/85	C D A E H F P G R N S
93 St. Matthew-Hall	10/85	C D A E H F P G R N S
94 Gulf of Mexico	11/85	C D A E H F P G R N S
95 California	1/86	C D A E H F P G R N S
96 Atlantic	2/86	C D A E H F P G R N S
97 Diapir Field	3/86	C D A E H F P G R N S
98 Gulf of Mexico	4/86	C D A E H F P G R N S
RS-6	5/86	P G R N S
99 Norton Basin	6/86	C D A E H F P G R N S
100 S. Alaska *	8/86	C D A E H F P G R N S
101 St. George Basin	10/86	C D A E H F P G R N S
102 Gulf of Mexico	11/86	C D A E H F P G R N S

C - Call for Information
D - Information Due
A - Area Selection
E - Draft Environmental Impact Statement
H - Public Hearing

F - Final Environmental Impact Statement
P - Proposed Notice of Sale
G - Governors' Comments Due
R - DOE Review
N - Notice of Sale
S - Sale

* includes Cook Inlet, Shumagin, Kodiak, Gulf of Alaska

Figure III-5

Different Planning Areas: Under Alternative II the proposed planning areas are organized slightly differently than Alternative I-1. Figure III-6 illustrates the differences around the Continental U.S. The Atlantic Coast remains divided into three planning areas, the North Atlantic, Mid-Atlantic, and South Atlantic. This is different from the current situation only in that the Blake Plateau leasing area has been eliminated and combined with the South Atlantic planning area.

The Gulf of Mexico consists of one planning area, eliminating the current "Central and Western Gulf," and "Eastern Gulf" leasing areas.

The Pacific Coast consists of three planning areas. In the south, the Southern California planning area combines the current "Southern California" and "Santa Barbara Channel" areas, as plans are to offer them in combination. The "Central and Northern California" planning area covers the same territory as the current Central and Northern California leasing area. Likewise, the Washington - Oregon are has not changed.

Figure III-7, illustrates the Alaska OCS planning areas. They are basically the same as described under Alternative I-1 and illustrated in Figure III-4, except for a slight difference in the boundary between the Navarin and Aleutian Basin planning areas.

b. Summary of Activities Resulting from this Alternative

The resources recovered, and the activities resulting from the adoption of this alternative, would be the same as Alternative I-1 (see tables III-5 and III-6), except in the Navarin Basin. Only one sale is scheduled in the Navarin Basin, under this alternative, so the levels of activity and resource recovery would be lower than Alternative I. The presence of a sale in the St. Matthew-Hall area would not be expected to lead to significant activity there, beyond a small number of exploratory wells, since economically recoverable resources are not expected to be found. Only the resource estimates which are different than those presented for Alternative I-1 (see Table III-6) are presented below.

Table III-10
Conditional Mean Estimates of Resources to be
Recovered as a Result of Adoption of Alternative II

Planning Area	Oil/billion bbls	Gas/Tcf	Transportation	Probability of Economic Success
Navarin Basin	.3	1.8	Pipeline/Tanker	.76
St. Matthew-Hall	.0	.0	--	--
OCS Totals*	8.2	38.1		

*Total OCS figures are calculated from total OCS estimates and are not column totals.

In the remainder of the OCS planning areas, there would be only minimal differences between this Alternative, and Alternative I-1 or I-2, caused by the scheduling of the Reoffering Sales, or the slightly different scheduling of sales in some areas. Table III-11 presents the development (again limited only

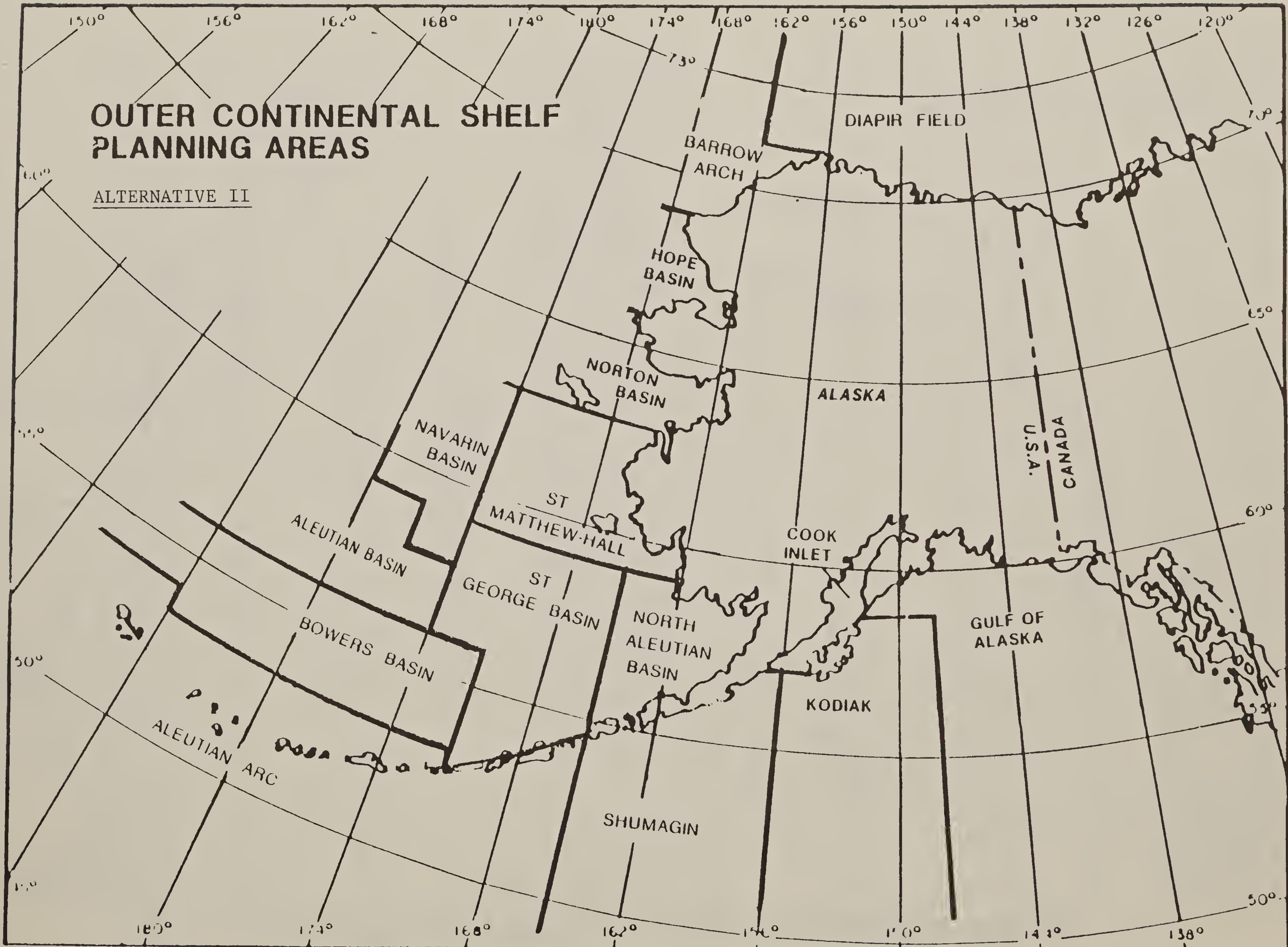
OUTER CONTINENTAL SHELF PLANNING AREAS

ALTERNATIVE II

U.S. Department of the Interior Map

Figure III-6

Figure III-7



U.S. Department of the Interior Map

TABLE III - 11

Estimated Development to Result from the Adoption of Alternative II

The April 1981 Schedule with Planning Area Offerings

Planning Area	Number of Wells		Number of Platforms	Number of Oil Spills				Exploratory Wells			Platforms			Devlpmt/Prod. Wells		
	Exploratory	Development/ Production		Production 1K bbls	Production 10K bbls	Transportation 1K bbls	Transportation 10K bbls	First	Most Intense	Last	First	Most Intense	Last	First	Most Intense	Last
				All other planning areas are the same as Alternative I-1.												
Navarin Basin	11	57	2	.2	.1	1.1	.5	1985	1987-88	1988	1988	1990	1993	1989	1990-92	1996
St. Matthew-Hall	5	0	0	.0	.0	.0	.0	1988	1990	-	-	-	-	-	-	-
Totals*	1560	5109	260	6.2	2.6	23	11.3									

* OCS totals must be calculated from total OCS resource estimates and are not column totals.

to the planning areas listed in Table III-10) levels expected to result from the adoption of this Alternative. Table III-11 b presents the amounts of effluents expected to result from Alternative II.

The numbers of pipelines, support bases, marine terminals, and refineries is expected to be the same as expected from Alternative I-1 (see Table III-6b).

Table III-11b

Quantities of Effluents Released
by OCS Well Drilling
Alternative II

Planning Area*	Drilling Mud Millions of bbls	Cuttings Thousands of Cu. Yds.	Formation Water Billions bbls over life of field
Navarin Basin	.04	13	.3
St. Matthew Hall	.01	0	0
OCS Totals	13.6	1981	18

*Only planning areas with different quantities from Table III-6b as presented here.

c. Summary of Activities Resulting from the Development Resources within the Planning Areas

The resources recovered, and the development resulting from total resource recovery would be the same as predicted for Alternative I-1 and presented in Table III-9.

d. Summary of Environmental Impacts of Alternative II

Estimates of resource recovery, and levels of development predicted, are the same for this alternative as they are for Alternative I-1, and the expected impacts resulting from this schedule adoption are the same in all planning areas except the following:

In California, land use impacts could be increased by the lack of specificity of sales listed on the schedule.

Water quality impacts around drilling rigs are expected to be lower (50 percent reduction in effluents) in the Navarin Basin, but other impacts are expected to remain essentially as expected for Alternative I-1.

In the St. Matthew-Hall area, fishermen could experience short termed (two to three years) competition for port space, causing minor economic loss. Noise and traffic effects on coastal breeding and feeding areas, finfish, and marine mammals would not be sufficient in intensity or duration to cause more than short-termed disturbance, with no lasting effects on populations. Direct disturbance of native subsistence cultures, or reductions in food resources, would be very low due to the very low levels of expected activity.

C. Alternative III: The Current Schedule

1. The Current Schedule Using the Current Leasing System: No Action

a. Description of Alternative III-1

1) The Schedule: Under this alternative, the Secretary could opt to take no action, and continue using the present schedule and leasing process as described in Chapter II.A., pages 34-67 of the FEIS. Under this alternative, there would be no change in the size of offerings or sales, i.e., OCS leasing would not be accelerated. Only one change would have an effect on the schedule, that is, the dropping of Sale 61, Kodiak, which was to have been held in April 1983. Extremely low industry interest caused the Secretary to drop the sale and all preparations for it, so that time, effort, and equipment could be devoted to more prospective areas. It can be assumed that this schedule would eventually be extended past 1985 during one of the annual reviews, at least no later than 1984. This would offer the Secretary the opportunity to tailor the new schedule, based on experiences gained in OCS exploration during this, and the next two years. Sales in areas which proved to be non-productive, could be removed from the schedule.

2) Summary of Activities Resulting from the Alternative:

Similiar estimates to these were provided in the FEIS, but those were in the form of risked estimates, and therefore not directly comparable with those presented below.

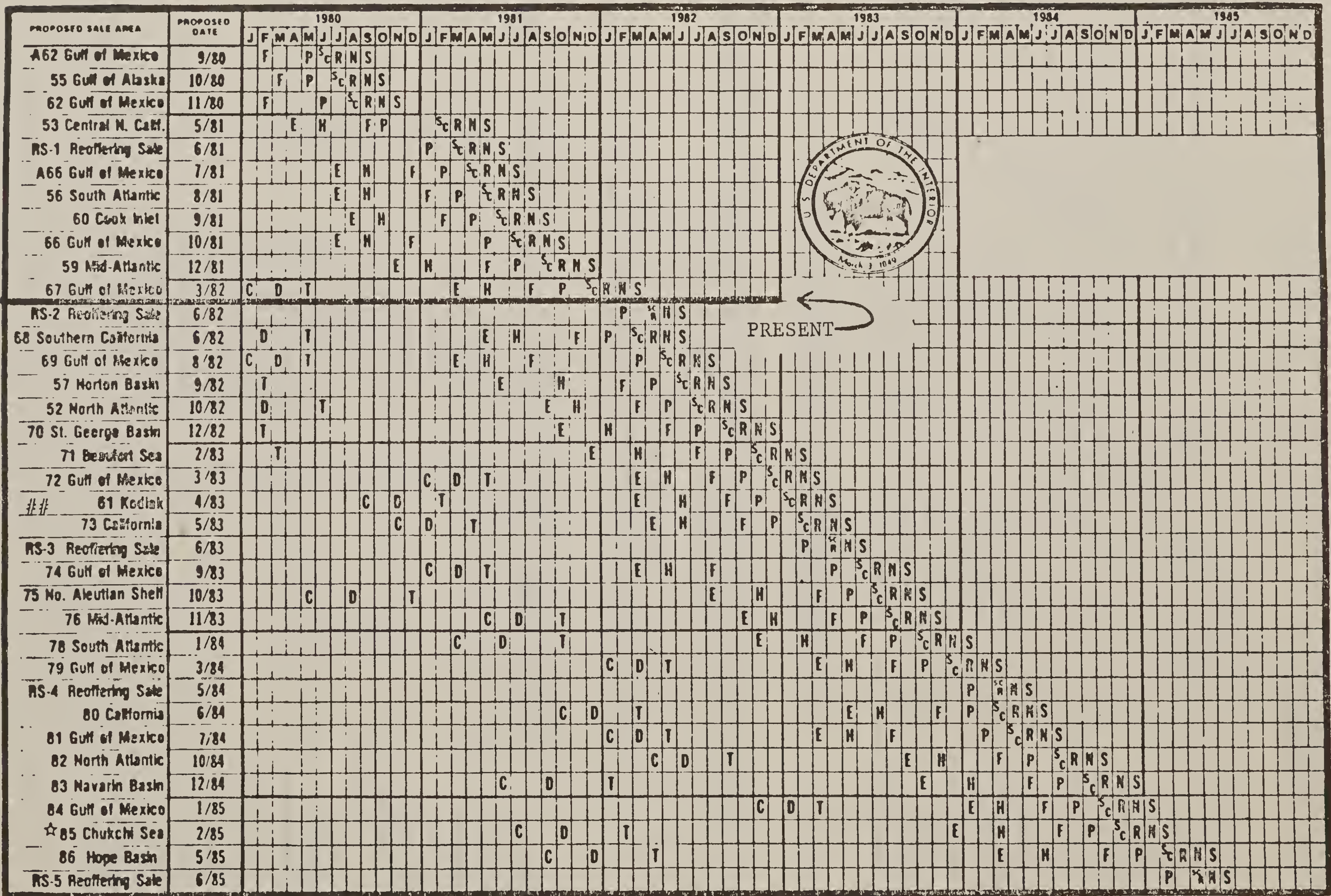
Table III-12
Conditional Mean Estimates of Resource to be
Recovered as a Result of Adoption of Alternative III-1

Planning Area	Oil/billion bbls	Gas/Tcf	Transportation	Probability of Economic Success
North Atlantic	.3	1.2	Tanker	.93
Mid Atlantic	.6	2.5	Tanker/Pipeline	.99
Blake Plateau	.2	.7	Tanker	.78
South Atlantic	.1	.1	Tanker	.27
E. G. of Mexico	.03	.57	Pipeline/Tanker	.87
C.&W. G. of Mexico	.388	5.2	Pipeline	1.00
S. California	.24	.35	Pipeline/Tanker	1.00
Santa Barbara	.29	.57	Pipeline/Tanker	1.00
C. & N. California	.2	.3	Tanker/Pipeline	.99
St. George Basin	.2	1.0	Pipeline/Tanker	.64
N. Aleutian Shelf	.2	.9	Pipeline/Tanker	.42
Navarin Basin	.2	1.4	Pipeline/Tanker	.78
Norton Sound	.1	1.1	Pipeline/Tanker	.57
Hope Basin	.1	.8	Pipeline/Tanker	.24
Chukchi Sea	.2	.8	Pipeline/Tanker	.76
Beaufort Sea	.8	4.4	Pipeline	1.00
Total OCS*	3.6	19.1		

*Total OCS figures are calculated from total OCS estimates and are not column totals.

FINAL 5-YEAR OCS OIL & GAS LEASING SCHEDULE

JUNE 1980



C - Call For Nominations
D - Nominations Due
T - Tentative Tract Selection
E - Draft Environmental Statement
H - Public Hearing
F - Final Environmental Statement
P - Proposed Notice of Sale
S_c - State Comments Due
R - Energy Review
N - Notice of Sale
S - Sale

☆ The holding of the Chukchi Sale at this time is contingent upon a reasonable assumption that technology will be available for exploration and development of the tracts included in the sale.

Sale 61 (Kokiak) has been dropped from this schedule.

Figure III-8

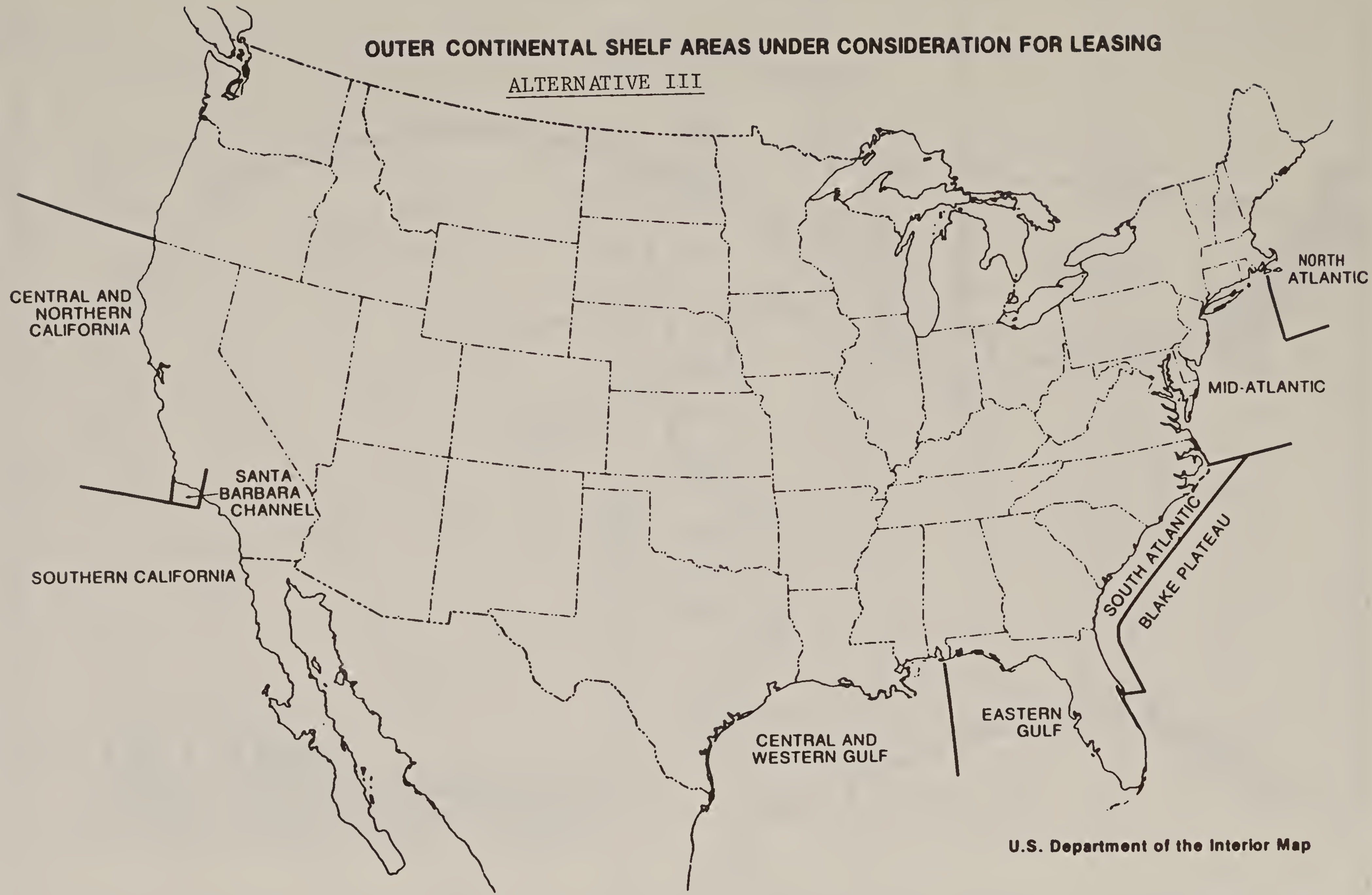
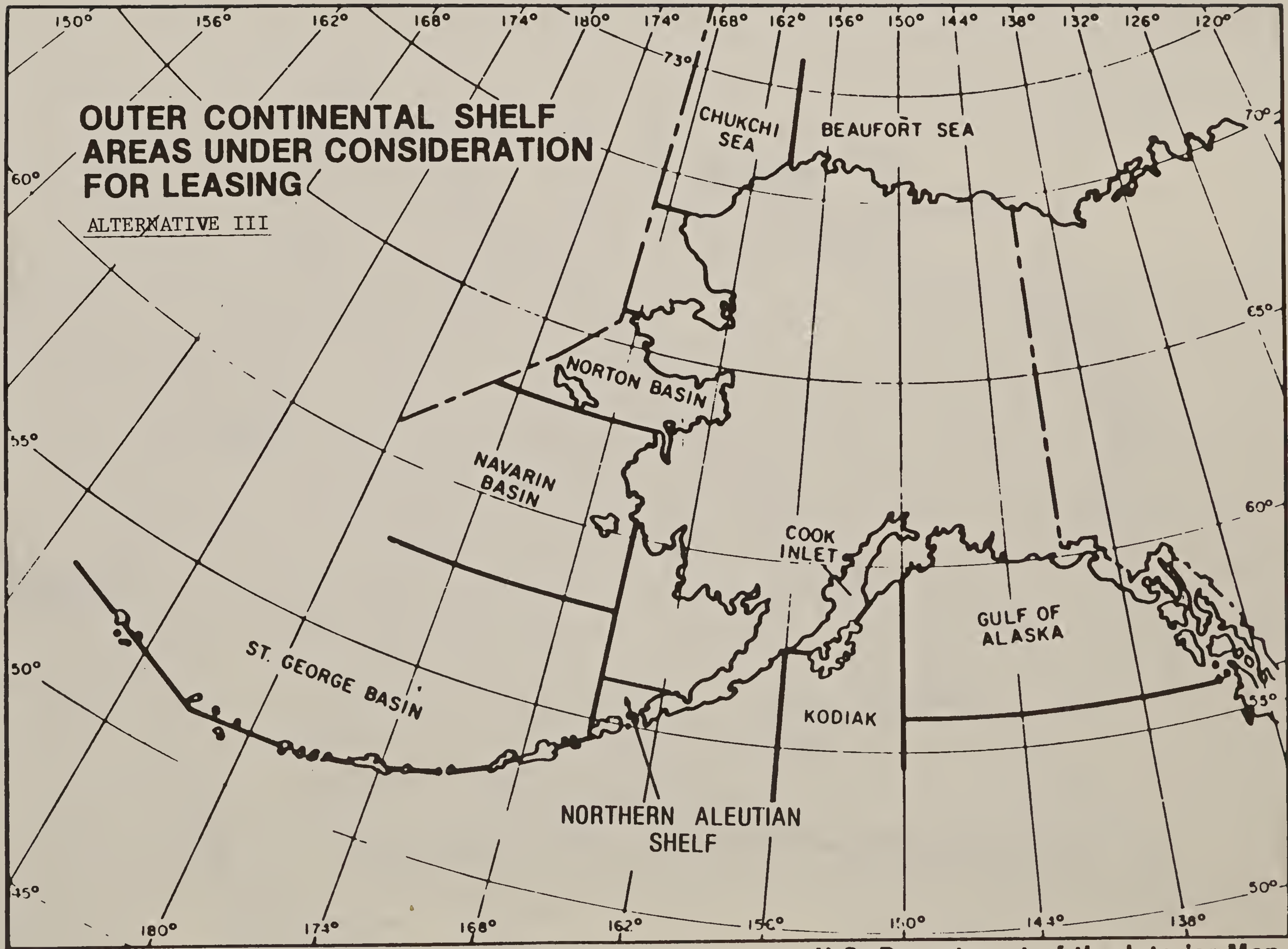

OUTER CONTINENTAL SHELF AREAS UNDER CONSIDERATION FOR LEASING
ALTERNATIVE III
CENTRAL AND NORTHERN CALIFORNIA
SANTA BARBARA CHANNEL
SOUTHERN CALIFORNIA
NORTH ATLANTIC
MID-ATLANTIC
SOUTH ATLANTIC
BLAKE PLATEAU
EASTERN GULF
CENTRAL AND WESTERN GULF
U.S. Department of the Interior Map

Figure III-9



U.S. Department of the Interior Map

Figure III-10

TABLE III - 13
Estimated Development to Result from Adoption of Alternatives III-1
The Current Leasing Schedule and Leasing System

Planning Area	Number of Wells: Exploratory	Number of Wells: Development/ Production	Number of Platforms	Number of Oil Spills: Production 1K bbls	Production 10K bbls	Transportation 1K bbls	Transportation 10K bbls	Exploratory Wells: First	Most Intense	Last	Platforms: First	Most Intense	Last	Devlpmt/Prod.Wells: First	Most Intense	Last
North Atlantic	28	123	5	.2	.1	.9	.5	1983	1984-86	1992	1989	1991	1997	1990	1991-92	2002
Mid Atlantic	90	422	17	.5	.2	1.9	1.0	1984	1985-87	1993	1990	1991-93	1999	1991	1991-94	2004
Blake Plateau	36	119	5	.1	.1	.7	.4	1985	1987-88	1994	1988	1990-91	1996	1981	1990-92	1998
South Atlantic	18	32	1	.1	.02	.2	.1	1985	1985-86	1989	1988	1988	1988	1989	1989-90	1990
E.G.of Mexico	98	196	8	.03	.01	.1	.04	1982	1984-86	1996	1985	1987-89	1999	1986	1988-90	2001
C&WG.of Mexico	411	869	72	.3	.12	.7	.2	1982	1983-85	1996	1983	1985-87	1998	1983	1986-88	2000
S.California	52	236	9	.2	.1	.7	.22	1983	1985-87	1994	1986	1989-90	1996	1987	1990	1998
Santa Barbara	78	314	13	.23	.1	.8	.4	1983	1985-87	1994	1986	1989-90	1996	1987	1990	1998
C&N California	38	191	8	.6	.1	.6	.4	1984	1985-86	1993	1987	1988-89	1995	1988	1989-90	1997
N.Aleutian Shelf	8	36	1	.1	.1	.7	.3	1984	1986	1992	1987	1987	1987	1988	1988-90	1990
St. George Basin	8	36	1	.1	.1	.7	.3	1984	1985-86	1989	1988	1988	1988	1989	1989-91	1991
Navar Basin	11	44	2	.2	.1	.8	.4	1986	1988-89	1984	1989	1991	1994	1990	1995	1997
Norton Sound	9	27	1	.1	.04	.5	.2	1984	1986	1992	1988	1988	1988	1989	1989-90	1991
Hope Basin	6	9	1	.04	.02	.2	.1	1986	1988	1990	1990	1990	1990	1991	1991-92	1992
Chukchi Sea *	8	38	1	.2	.1	.7	.3	1986	1989	1996	1990	1990	1993	1991	1991-2000	2003
Beaufort Sea *	22	166	4	.7	.3	1.5	.4	1984	1986-88	1994	1986	1986-95	1995	1987	1992-99	2005
OCS Totals	921	2706	147	3.3	1.4	9.9	4.1									

* Includes only the portion of the planning area in water depths of 0-100 meters.
** OCS totals must be calculated from total OCS resource estimates and are not column totals.

Table III-14

Estimated Development to Result from the Adoption of Alternative III-1

The Current Schedule and Leasing System

	N. Atlantic	Mid Atlantic	S. Atlantic	Gulf of Mex.	S. Calif.	C & N Calif.	Gulf of Alaska	Cook Inlet	N. Aleut. Shelf	St. George B.	Navarin Basin	Norton Sound	Chukchi Sea	Beaufort Sea	Totals
Number of new pipelines*															
Oil	0	0	0	0	30	15	1	1	1	1	1	1	1	1	65
Gas	1	1	1	3			0	0	1	1	1	1	1	1	
Number of Support bases															
New	2	1	1	4	1	3	0	0	1	1	0	2	1	0	17
Expansions	1	1	2	30	1	0	0	0	0	0	0	0	0	1	36
Marine Terminals															
New	0	0	1	1	0	0	1	0	1	1	0	1	1	0	7
Expansions	0	0	0	0	4	9	0	0	0	0	0	0	0	1	14
Oil Refineries															
New	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Expansions	0	0	0	3	0	0	0	0	0	0	0	0	0	0	3
Gas Processing Plants															
New	1	1	1	2	0	1	0	1	1	0	0	0	1	0	9
Expansions	0	0	0	10	0	0	0	0	0	0	0	0	0	0	10

*Some pipelines extend only within the producing field or between fields. Some pipelines carry both oil and gas.

Table III-13 provides estimates of development resulting from the recovery of the above listed resources. Only the sales remaining to be held are included in the calculation.

Total resource recovery is, of course, impossible under this alternative, but given enough five year schedules and sales in each planning area, the same levels of resource recovery, and amounts of resultant development activity would eventually take place as are estimated for Alternative I-1. The principal difference is that the pace of activity would be slower, and the final number of platforms and wells would be put in place up to 40 years later than forecast for Alternative I-1 in Table III-13.

b. Summary of Environmental Impacts of Alternative III-1

In the North and Mid-Atlantic, fewer oilspills would potentially ground on the islands and beaches near Raritan Bay, adversely affecting recreation beaches and wetlands. Long Island recreation beaches on the south side of the island would have a six percent chance instead of a ten percent chance, of being oiled by a spill caused by an OCS related tanker accident. Finfish, shellfish, and benthic organisms would experience lower levels of stress from drilling effluents, due to the reduced number of wells and platforms expected. Reductions in fish stocks due to oilspill accidents, and losses from gear conflicts to fishermen, would be less than Alternative I-1 because of the 25 percent fewer oilspills and 26 percent fewer platforms expected.

In the South Atlantic, this alternative would result in a reduced amount of activity, which could be expected to reduce the impacts on all resources of concern by some degree, although impact levels would remain essentially the same. No single resource would experience a significantly lower level of impacts when compared to Alternative I-1.

Impacts expected for most concerns in the Central and Western Gulf of Mexico would not be significantly different than expected for Alternative I-1. Significant decreases in conflicts from those prediced in Alternative I-1 could be expected in relation to military use areas, and vessel platform conflicts. Coastal recreation sites, beaches primarily, could receive one oilspill grounding, causing a reduction in tourist income for the immediate area, but amounting to less recreation impact than expected from Alternative I-1. Up to 14 percent fewer new residents and workers would result from this alternative, but neither alternative would cause more than very low levels of impact on local infrastructures or services.

Impacts on water quality in Southern California could be reduced from Alternative I-1, because of the 50 percent reduction of drilling effluents. As this alternative would also have half the oilspills expected from Alternative I-1, impacts on water quality in the Santa Barbara channel could also be reduced. Estuaries, marshes and wetlands between Point Conception and Tijuana Estuary would have less likelihood of being oiled, and receiving damage to fin and shellfish breeding, and nursey areas, and impacts to seabirds, both from direct oiling and distruction of nesting areas. Impacts on great whales would be less under this Alternative, than I-1. Population increases caused by OCS activities would be lower by 57 percent, under this alternative, in the Santa Barbara-Ventura area, causing impact levels on infrastructure and services to be very low. Central and Northern California would experience less than half

the water demands under this alternative, causing low impacts on local water supplies. As this alternative could cause only 40 percent of the oilspills of Alternative I-1, damage to coastal ecosystems, estuarine and wetland breeding and nursery areas, would be less. A 50 percent reduction in the number of expected platforms, compared to I-1, would reduce gear conflicts with fishermen, as well as disturbance of subtidal benthos.

No sales are scheduled in Cook Inlet, Gulf of Alaska, Kodiak and Shumagin under this alternative, therefore the impacts expected in Alternative I-1 for Sale 100 would be eliminated.

The smaller size of the area called "North Aleutian Shelf" under this alternative would remove the possibility of leasing directly in Bristol Bay as does the North Aleutian Basin in Alternative I-1. Impacts caused by conficts with other activities, especially commercial and subsistence fishing would be eliminated. Impacts to endangered species, and marine mammals such as the grey whale would be reduced.

In the St. George Basin, lower numbers of expected oilspills under this alternative would reduce adverse effects on grey whales, birds and marine mammals.

In the Navarin, Norton, Hope Basins, and Barrow Arch, impacts would be slightly lower than expected for Alternative I-1 but not enough to cause a significant reduction in impact levels.

In the Diapir Field, endangered whale species such as the bowhead, would experience substantially reduced impacts as tracts within or near the narrow spring migration corridor and feeding grounds would not be offered. Impacts on ringed seal and migratory waterfowl and seabirds would be reduced to low.

2. Option Offering Greater Amounts of Acreage Per Sale

a. Description of Alternative III-2

1) <u>The Schedule</u>: This alternative, recommended by the Natural Resources Defense Council (NRDC), would continue to use the present schedule (Alternative III), and leasing system, except that the Department would offer more acreage at each sale. Assuming twice as much area was to be offered as in III-1, acreage offered could increase from 1.5 million, to as many as 3 million acres in most OCS planning areas, and up to 5 million in high interest frontier areas in Alaska. The same general areas presently being offered would continue to be offered, but with more complete coverage, and possibly with expanded geographic extent. The same deletion possibilities as presently employed for the protection of sensitive, hazardous, or use conflict areas would continue in effect as would be the case with all alternatives. A comparison of possible acreage offered by this alternative (III-2), the present system (III-1), and the proposed schedule (I-1) is presented below.

OCS Region	Present (III-1)*	This Alternative (III-2)*	Proposal (I-1)*
Atlantic	4.8	12	203
Gulf of Mexico	8.6	12	114
Pacific	3.6	9	83
Alaska	8.4	29	427

* million acres

The location and timing of sales under this alternative would remain as described in the FEIS on pages 34-41. This increase in acreage offered could be assumed to lead to an increase in acreage leased. If the same assumptions can be made for this alternative as are made for Alternative 1, then industry will lease as much acreage as they can productively explore and develop. Therefore, the amount of acreage leased under this option would probably be more similar to Alternatives I-1 and I-2, than to Alternative III-1.

2) Summary of activities resulting from the adoption of the alternative. The following table lists the resource expected to be recovered by this option to alternative III. A study of Table III-12, covering Option I of this alternative, indicates that some areas, notably in Alaska, show the same estimates for either option.

Table III-15
Conditional Mean Estimates of Resources to be
Recovered as a Result of Adoption of Alternative III-2

Planning Area	Oil/billion bbls	Gas/Tcf	Transportation	Probability of Economic Success
North Atlantic	.3	1.2	Tanker/Pipeline	.93
Mid Atlantic	.8	3.4	Tanker	.99
Blake Plateau	.2	.9	Tanker	.78
South Atlantic	.1	.2	Tanker	.27
E. G. of Mexico	.04	.07	Tanker	.87
C. & W. G. of Mexico	.46	6.1	Pipeline	1.00
S. California	.27	.4	Pipeline/Tanker	1.00
Santa Barbara	.35	.7	Pipeline/Tanker	1.00
C & N California	.3	.4	Tanker/Pipeline	.99
St. George Basin	.2	1.0	Pipeline/Tanker	.64
N. Aleutian Shelf	.2	.9	Pipeline/Tanker	.42
Navarin Basin	.3	1.8	Pipeline/Tanker	.78
Norton Sound	.1	1.1	Pipeline/Tanker	.57
Hope Basin	.1	.8	Pipeline/Tanker	.24
Chukchi Sea	.3	1.1	Pipeline/Tanker	.76
Beaufort Sea	.8	4.43	Pipeline	1.00
OCS Total	4.2	20.0		

Table III-16 presents the levels of development expected from the adoption of this option to Alternative III-1.

b. Summary of Environmental Impacts of Alternative III-2.

Impacts from this alternative will occur in approximately the same areas as those expected in Alternative III-1. The results of offering

TABLE III - 16

Estimated Development to Result from the Adoption of Alternative III-2

The Current Leasing System Offering Greater Amounts of Acreage

Planning Area	Number of Wells		Number of Platforms	Number of Oil Spills				Exploratory Wells			Platforms			Devlpmt/Prod. Wells		
	Exploratory	Development/ Production		Production		Transportation		First	Most Intense	Last	First	Most Intense	Last	First	Most Intense	Last
				1K bbls	10K bbls	1K bbls	10K bbls									
North Atlantic	28	123	5	.2	.1	1.1	.7	1983	1984-86	1992	1986	1988	1994	1987	1988-89	1996
Mid Atlantic	118	564	23	.6	.3	2.6	1.3	1984	1985-87	1993	1987	1988-90	1996	1988	1988-91	1998
Blake Plateau	40	157	6	.2	.1	.9	.5	1985	1987-88	1994	1988	1990-91	1996	1989	1990-92	1998
South Atlantic	26	44	2	.1	.03	.3	.2	1985	1985-86	1989	1988	1989	1990	1989	1989-92	1992
E.G.of Mexico	112	224	10	.03	.01	.1	.1	1982	1984-86	1996	1985	1987-89	1999	1986	1988-90	2001
C&WG.of Mexico	482	1021	85	.4	.2	.8	.2	1982	1983-85	1996	1983	1985-87	1998	1983	1986-88	2000
S.California	62	276	11	.22	.1	.8	.4	1983	1985-87	1994	1986	1989-90	1996	1987	1990	1998
Santa Barbara	88	367	15	.3	.11	1.0	.5	1983	1985-87	1994	1986	1989-90	1996	1987	1990	1998
C&N California	48	254	10	.2	.1	.9	.5	1984	1985-86	1993	1987	1988-89	1988	1988	1989-91	1991
St. George Basin	8	36	1	.1	.1	.7	.3	1984	1985-86	1989	1988	1988	1988	1989	1989-91	1991
N.Aleutian Shelf	8	36	1	.1	.1	.7	.3	1984	1986	1992	1987	1987	1987	1988	1988-90	1990
Navarin Basin	11	56	2	.2	.1	1.1	.5	1986	1988-89	1984	1989	1991	1994	1990	1992	1997
Norton Sound	9	27	1	.1	.04	.5	.2	1984	1986	1992	1988	1988	1988	1989	1989-90	1991
Hope Basin *	6	9	1	.04	.02	.2	.1	1986	1988	1990	1990	1990	1990	1991	1991-92	1992
Chukchi Sea *	8	47	1	.2	.1	.9	.4	1986	1989	1996	1990	1990	1990	1991	1991-2000	2000
Beaufort Sea *	22	166	4	.7	.3	1.5	.4	1984	1986-88	1994	1986	1986-95	1995	1987	1992-99	2005
OCS Totals **	1068	3218	172	3.3	1.6	12.1	5.8									

* Includes only the portion of the planning area in water depths 0-100 meters.

** OCS totals are calculated from total OCS estimates and are not column totals.

more acreage will, in most planning areas, cause an increase in leasing, and elevated levels of activity over what is expected in III-1, but the doubling of acreage offered is not expected to result in a concomittant increase in activity and impacts. Some incease in the levels of expected impacts is expected to occur, but the amount will not be sufficient to be measurable. Alternative III-2 would therefore be expected to cause impact levels similiar to Alternative III-1.

D. Alternative IV: Change the July 1981 Schedule by Modifying the Number and Timing of Alaska Sales

This alternative responds to the concerns of the State of Alaska and the City of Kaktovik. It is presented in two parts:

-- IV-1 discusses reducing the number of sales in Alaska waters to nine, and changing the scheduled dates of other Alaska sales in response to concerns expressed by the State of Alaska (See Figure III-1).

-- IV-2 discusses dropping all sales in the Arctic area, in response to concerns expressed by the City of Kaktovik. A schedule of 11 Alaska sales would result (See Figure III-1).

Each part of the alternative is further divided into the planning area-wide (a), and the favorable geological areas (b) options.

1. Alternative IV-1: Reduce the Number of Alaska Sales from 16 to nine, and Delay Certain Sales Within the Schedule.

Option a. Full Planning Area-Wide Offerings

1) Description of Alternative IV.1.a

a) The Schedule: This alternative recognizes the concerns of the State of Alaska about the sensitivity of the arctic environment, the difficulty of working in arctic or subarctic conditions, the problems of working in deep and rough water, and concerns over possible multiple use conflicts.

This alternative would be similar to the proposal in all areas of the OCS except Alaska, where nine sales would be held under this alternative, instead of 16.

In 1982, two tract specific type sales are scheduled, Sale 57 in Norton Basin and Sale 71 in Diapir Field. Sale 57 would be allowed to continue as scheduled because many of the pre-sale steps have been accomplished. Sale 71, in the Diapir Field, is scheduled to take place in September 1982, both in Alternative I-1 and this alternative.

In 1983, two sales are are scheduled in Alternative I-1. This alternative would move Sale 70 to 1986, and drop Sale 75 from the schedule, leaving no sales in 1983 in the Alaska OCS. This would delay, by one year, all Alaska OCS activity from future sales on the schedule, giving coastal communities more time to complete planning programs, and it would add one year to the time in which industry and Government could learn more about the difficulties of

working in arctic waters, and about the sensitivities of certain areas in the Alaska OCS.

By 1984, all OCS sales will have reached full planning-area proportion, and two such sales are scheduled that year, Sale 87 in Diapir Field and Sale 100, the South Alaska sale. Both are new sales in terms of the June 1980 schedule, and both are in areas in which Alaska believes leasing is least objectionable.

Two sales would be scheduled in 1985, Sale 83 in the Navarin Basin and Sale 97 in the Diapir Field. Sale 83 is scheduled to take place in 1984 in Alternative I-1, so this alternative delays that sale by one year.

In 1986, sales are scheduled in St. George Basin, Norton Basin, and one combined sale (85/86) would offer Hope Basin and Barrow Arch together. This would constitute the first planning area-wide sale in Norton Basin, and should allow industry ample time to gain experience in the area from Sale 57 in 1982. The delay of Sale 70, St. George Basin to this time would allow five or more years additional experience and knowledge to be acquired prior to the first well being drilled in that area. Also, more experience in severe arctic operations will have been accumulated, mostly through drilling in the Diapir Field, by the time the first operations resulting from the combined Hope/Barrow sale take place.

Using estimates of leased acreage per sale from Table III-3, the following comparison can be made between the proposal and this alternative.

Table III-17
COMPARISON OF ESTIMATED MAXIMUM ACREAGE LEASED
EACH YEAR IN THE ALASKA OCS

	Proposal (Alt. I)	Alt. IV-1	1980 Schedule (Alt. III-1)
		1982	
	1,396,000	1,396,000	2,161,000
		1983	
	3,047,000	0	2,282,000
		1984	
	9,060,000	2,880,000	1,280,000
		1985	
	4,200,000	5,940,000	1,280,000
		1986	
	7,620,000	5,700,000	____
Totals	25,323,000	15,916,000	7,003,000

Except for 1985, this alternative would probably result in smaller amounts of the Alaska OCS being leased each year, than Alternative I-1. The effects of streamlining the leasing process would cause the amount of acreage leased to surpass the present (1980) schedule by 1984.

b) Summary of activities resulting from the adoption of this option to Alternative IV-1: Since no change in the schedule is proposed for any area outside Alaska, the following summary tables (III-18 and III-19) list only Alaska planning areas. For the remainder of the OCS, resource and developmental estimates would be the same as described in Alternative I-1.

Table III-18
Conditional Mean Estimates of Resources to be Recovered as a Result of Adoption of Alternative IV-1.a.

Planning Area	Oil/billion bbls	Gas/Tcf	Transportation	Probability of Economic Success
S. Alaska (G. of Alaska, Kodiak, Cook, Shumagin)	.1	.8	Pipeline/Tanker	1.00
St. George Basin	.2	1.0	Pipeline/Tanker	.64
Navarin Basin	.3	1.8	Pipeline/Tanker	.76
Norton Basin	.2	1.2	Pipeline/Tanker	.57
Hope/Barrow*	.2	1.1	Pipeline/Tanker	.82
Diapir Field*	1.7	8.9	Pipeline	1.00
Total OCS**	7.8	35.6		

* Only in water depths 0-100 meters

**Total OCS figures must be calculated from OCS-wide estimates and are not the totals of planning area conditional estimates.

Table III-19 presents the development in the Alaska OCS resulting from the adoption of this option.

2. Summary of Environmental Impacts of Alternative IV-1.a.

Impacts resulting from the adoption of this alternative would be the same as those expected for Alternative I-1 in all planning areas outside of the Alaska OCS.

Impacts resulting from Sale 100, scheduled one year earlier than Alternative I-1 in this alternative, would be at the same levels, except they could be expected to start earlier in the Gulf of Alaska, Kodiak, Cook, or Shumagin planning areas.

No sales are scheduled in the North Aleutian Basin, so impacts from two sales expected under Alternative I-1 would not take place.

In the St. George Basin, expected impacts would be delayed at least three years.

The principal difference between this alternative and Alternative I-1 would be the generation of 50 percent fewer permanent residents. As most would locate in Anchorage, the scarcity of adequate housing, crowding of schools, and other public services expected in Alternative I-1 would be less under this alternative. Disturbance of wildlife in coastal areas from aircraft noise and

TABLE III - 19

Estimated Development to Result from the Adoption of Alternative IV-1, Options a. and b.
Deleting Certain Alaska Sales and Delaying Others

Planning Area	Number of Wells		Number of Platforms	Number of Oil Spills				Exploratory Wells			Platforms			Devlpmt/Prod. Wells		
	Exploratory	Development/ Production		Production 1K bbls	Production 10K bbls	Transportation 1K bbls	Transportation 10K bbls	First	Most Intense	Last	First	Most Intense	Last	First	Most Intense	Last
								All other planning areas are the same as Alternative I-1.								
S. Alaska	7	26	1	.1	.04	.5	.2	1985	1986	1990	1990	1990	1990	1991	1991-94	1994
St. George Basin	8	36	1	.2	.1	.7	.3	1988	1989-90	1993	1992	1992	1992	1993	1993-95	1995
Navarin Basin	11	57	2	.2	.1	1.1	.5	1986	1988-89	1994	1989	1991	1994	1990	1995	1997
Norton Basin	15	35	2	.1	.1	.7	.3	1984	1986-88	1994	1988	1990	1993	1989	1989-90	1996
Hope/Barrow *	9	45	1	.2	.1	.8	.4	1988	1991	1997	1992	1992	1992	1993	1993-2003	2002
Diapir Field *	45	332	8	1.3	.5	3.0	.8	1984	1986-88	1996	1986	1989-90	1997	1987	1994-96	2007
OCS Totals **	1533	4984	259	6.2	2.6	22.7	10.7									

* Only in water depths 0-100 meters.

** OCS totals must be calculated from total OCS resource estimates and are not column totals.

oilspill contacts, would be less likely, as would damage to sensitive coastal ecosystems. The reduced numbers of sales in the Bering Sea could be expected to reduce the levels of impact on subsistence cultures in the coastal areas, due to reduced contacts between those people, and the oil and gas workers, and because of the lower chance of subsistence food resources being adversely affected by oil and gas activity, and oilspills. Other environmental concerns would receive impact levels similiar to Alternative I-1; however, water quality, endangered species, and habitats of special concern would receive the same levels of impacts exected in Alternative III-1.

In the Navarin Basin, a 50 percent reduction of effluents would cause an indeterminable reduction in impacts on water quality from those expected in Alternative I-1. All other impacts would be the same as expected for Alternative I-1.

In the Norton Basin, dropping one sale would not materially change impact levels expected to result in Alternative I-1. The reduced number of expected oilspills could mean that a smaller number would be likely to contact sensitive coastal ecosystems.

Combining the Hope and Barrow sales and shifting the dates of Diapir Field sales, would result in no differences in any types or levels of impact than expected from Alternative I-1.

Option b. Offering Only Areas of Hydrocarbon Potential

1) Description of Alternative IV-1.b

a) The Schedule: The schedule presented in this option would be exactly the same as that described under Option (a) of this alternative. The only difference is the consideration of the option, in Alaska as well as the remainder of the OCS, of offering only areas of hydrocarbon potential at each sale.

b) Resource and development estimates: It is believed that resource and development estimates for Alaska will be the same for this option as for Option (a), and in the remainder of the OCS they will be exactly the same as those estimated for Alternative I-1. Likewise, total resource recovery estimates and development figures would be the same as those presented for Alternative I-1.

2) Summary of Environmental Impacts of Alternative IV-1.b.
These would be the same as expected in Alternative IV-1.a.

2. Alternative IV-2: Delete all Arctic Ocean Planning Areas, Eliminating all Sales in Hope Basin, Barrow Arch, and Diapir Field

Option a: Full Planning Area-Wide Offerings

1) Description of Alternative IV-2.a

a) The Schedule: This alternative responds to a comment submitted by the City of Kaktovik, expressing reservations about industry's ability to work safely in ice prone areas, and the possible incompatability of oil and gas operations, and subsistence hunting and fishing on the North Slope. Their recommendation was, that all leasing in Arctic waters be delayed. This would entail deleting the Hope Basin, Barrow Arch, and Diapir Field planning areas. Reinstating these areas could be a consideration in a future review of the 5-year schedule. At that time, if industry had gained sufficient experience in arctic drilling elsewhere, sales in these three areas could again be scheduled. Therefore, under this part of Alternative IV, OCS Lease Sales 71, 87, 85, 86, and 97 would be dropped from the schedule, leaving 38 proposed planning area-wide sales remaining on the schedule (see Figure III-1).

b) Resource Estimates and Predicted Development: Estimates of resources to be recovered, and the amount of development resulting from that recovery, would be the same as predicted for Alternative I-1 in all OCS areas, except the Arctic. In the Arctic planning areas, only activity resulting from leases issued at the Joint Federal/State Beaufort Sea Sale would continue to take place. The adoption of this alternative would forego the possible recovery of 1.9 billion barrels of oil and 9.8 trillion cubic feet of gas. In the remainder of the OCS, 6.5 billion barrels of oil, and 27.6 trillion cubic feet of gas would be recovered through the use of 1,507 exploratory wells and 4,783 development and production wells. Total spills expected would total 4.9 production spills of 1,000 barrels or more, and 19 transportation spills of 1,000 barrels or more.

2) Summary of Environmental Impacts of Alternative IV-2.a

Impacts on all resources, in all OCS planning areas outside of the Alaska Arctic would be the same as expected in Alternative I-1. Because no activity would result in the Arctic planning areas from this alternative, impacts to all environmental concerns, such as endangered species, and the impacts on native subsistence cultures will not take place.

Option b. Offering Only Favorable Geological Acreage

1) Description of Alternative IV-2.b

a) The Schedule: All leasing in Arctic waters would be delayed by deleting the Hope Basin, Barrow Arch, and Diapir Field planning areas. Reinstating these areas could be a consideration in a future review of the 5-year schedule. At that time, if it was felt that industry had gained sufficient experience in arctic drilling elsewhere, sales in these three areas could again be scheduled. Therefore, under this part of Alternative IV, OCS Lease Sales 71, 87, 85, 86 and 97 would be dropped from the schedule, leaving 38 proposed sales offering favorable geological acreage.

b) Resource estimates and predicted development: No difference in the resources to be recovered or the development levels to be reached, is expected between sales offering entire planning areas or, (as set forth in this option) offering only areas of hydrocarbon potential. Therefore, the resources to be recovered under this option outside the Arctic Ocean, would

be exactly the same as Alternative I-1 and I-2, as would the levels of development.

2) Summary of Environmental Impacts of Alternative IV-2.b.

No impacts would occur as a result of this schedule in the three deleted Arctic planning areas of Hope Basin, Barrow Arch, and Diapir Field. Impacts expected from the adoption of this alternative would be exactly the same as those expected from the adoption of Alternative I-1, in all areas outside the Arctic Ocean OCS.

E. Comparison of Alternatives

Number of Sales

Alternative I, with both of its options, lists 42 sales. Alternative II would also list 42 sales, the principle difference between I and II being that five of the sales in Alternative II are Reoffering sales. Alternatives IV-1 and IV-2 alter the timing and numbers of sales only in the Alaska OCS. Alternative IV-2 reduces the number of sales in Alaska by dropping all Arctic sales, reducing the total number on the schedule to 37. The other Alaska alternative, IV-1 reduces the number of sales in Alaska to 9, leaving 34 sales remaining on that schedule.

The two options of Alternative III cover a shorter length of time, and therefore are not directly comparable to Alternatives I, II and IV. The fact that both options to this alternative list only 26 sales is less meaningful than noting that Alternative III schedules an average of 7 sales per year compared to Alternative I, with its average of 8.

Average Amount of Acreage Leased

It is difficult to compare the alternatives and options as to which could result in the greatest amount of acreage leased since all but one call for a break in the historic pattern of OCS offerings.

There is the expectation that industry will react to the change in offering sizes by increasing its response to sales, but the extent of that response is unknown at this time. It can be assumed that, being unconstrained, industry will probably respond by leasing as much acreage as it feels it can develop within its own contraints (equipment, manpower, etc.). Therefore, although entire planning areas are offered, until industry has removed some of those contraints, the amount of acreage leased, and subject to being developed, will probably be greater than the present half million acre average, but it is almost certain that it will not approach the total acreage in even the smallest planning area, and at least for the present time may not even approach the total acreage underlain by formations having favorable oil and gas producing potential.

It is also difficult, at this time, to predict industry's pattern of response in terms of the location of the greatest level of effort. It is unknown at this time if the decision will be to spread the effort fairly evenly throughout the planning areas, in hopes of obtaining acreage, or to concentrate in known

hydrocarbon bearing areas in order to obtain a quick increase in production, or to concentrate in promising frontier areas to obtain reserves. The distribution of leasing under each of these possibilities would be different, as would the impacts on the environment.

If the assumption is made that leasing will be fairly evenly spread throughout the planning areas regardless of the alternative considered, those alternatives offering entire planning areas with the greatest number of sales offer the greatest potential of achieving the largest amount of leasing. Alternatives I-1 and II are in this category. It is believed, however, that there will be little difference in the total acreage leased, between the area-wide, or the favorable geological acreage options. In that case, Alternative I-2 can be added to the high acreage potential group. Should the average amount of acreage leased per sale double (500,000 acres to 1,000,000 acres) all of these alternatives (I-1, I-2 and II) have the potential of leasing up to 42 million acres.

Since Alternatives IV-1 and IV-2 are based on Alternative I, the same can be said of them as far as amounts of leasing to be expected outside of Alaska. Alternative IV-2 proposes dropping all Arctic Ocean sales, three in the Diapir Field and one each in Barrow Arch and Hope Basin, leaving 37 sales on the schedule. Using the same assumption mentioned before, this alternative, under either the area-wide (IV-2a) or favorable geological (IV-2b) options has the potential of leasing the second greatest amount of acreage (up to 37 million acres). Alternative IV-1 proposes 8 fewer sales in Alaska, for an OCS total 34 sales, or 34 million acres.

Alternative III-2, proposes using the current schedule and leasing system, but offering more acreage. If the assumption is made that "more acreage" meant at least twice as much, this alternative could provide up to 26 million acres. If the schedule was to be extended to cover the same 5-year time span, as does the proposal, this alternative could permit the leasing of 35 million acres, making it roughly the equal of Alternative IV-1.

Finally, Alternative (III-1) would, if the present leasing pace continues, offer the potential of leasing 13 million acres, and if also extended to cover five years, up to 18 million acres.

<u>Total Resources Recovered</u>

Alternatives I-1 and I-2 are expected to provide the same levels of resource recovery. An estimated 8.3 billion barrels of oil and 39 trillion cubic feet of gas could be recovered by the proposed July 1981 schedule employing either the planning area-wide option or the option of offering only favorable geologic acreage. Alternative II is only slightly behind, providing a potential of recovering 8.2 billion barrels of oil and 38.1 trillion cubic feet of natural gas.

Alternative IV-1, the proposed schedule with the delay and deletion of certain Alaska sales, under either of its options, is estimated to recover 7.8 billion barrels of oil and 35.6 trillion cubic feet of gas. The delaying of certain sales in Alaska would have no effect on the total amount of resource recovered, but the dropping of seven sales from the schedule would cause a seven percent reduction of the expected amount of oil to be recovered and a ten percent

reduction in gas estimates. Alternative IV-2 and its options, calling for the elimination of Arctic Ocean sales, forego the recovery of all resources not already leased in those three planning areas. Estimates of resources recovered by this alternative and its options are 6.5 billion barrels of oil and 27.6 trillion cubic feet of gas. Although fewer sales would be dropped from the schedule than the other Alaska alternative schedule (IV-1) this alternative reduces the resource estimates a greater amount because the highly protective Diapir Field area would not be tapped except as a result of sales held in the past.

Alternative III-2, by offering more acreage per sale than the current schedule, could be expected to produce up to 4.2 billion barrels of oil and 20 trillion cubic feet of natural gas, placing it only slightly ahead of Alternative III-1, the current schedule. Alternative III-1 holds the least promise in terms of oil and as recovery, 3.6 billion barrels of oil, and 19.1 trillion cubic feet of gas, or roughly 43 percent of the oil and 48 percent of the gas expected in Alternative I-1.

Oilspills

Oilspills are not in themselves adverse impacts, but rather, are the cause of impacts. They are, however, one of the most controversial occurrences in the OCS leasing program, and therefore the following discussions compares the alternative in terms of their oil spilling potential.

Since oilspill statistics are calculated partly on production estimates, the alternative schedules which are likely to produce the largest number of spills are those which have the potential of recovering the greatest volumes of oil. However, the calculations of potential oilspill probabilities are altered somewhat by the method of transportation expected in each planning area, and this may vary from alternative to alternative.

According to predictive calculations, both Alternative I-1 and I-2 have the highest number of prediced oilspills. Each could have 30.6 spills of greater than one thousand barrels.

Alternative II is predicted to have the next highest predicted level of oilspills. The reduced number of Navarin Basin sales and the addition of the St. Matthew-Hall sale (too few expected resources to cause spills) bring about the lower figure of 29.2 predicted spills. Slightly lower in expectations are the two options (planning area-wide and favorable geological acreage of Alternative IV-1. Dropping sales in Norton, Navarin, and St. George Basins reduces the estimates of resources to be recovered, and therefore lowers the expectations of spills. Both options to this alternative are predicted to cause up to 28.9 spills.

Alternative IV-2, both options, is predicted to have up as to 23.9 oilspills. Spill exectations are the same in all planning areas are predicted for Alternative I, except that all spills associated with Arctic Ocean sales are eliminated.

Alternative III-2, offering more acreage with the present leasing system, is lower in predicted spills, totalling up to 15.4, and finally, the no action Alternative (III-1), with its slower pace of leasing and resource reovery,

TABLE III-20

OCS-Wide Comparison of Expected Impact Levels of All Alternatives

Alternatives	Coastal Ecosys.	Water Qual.	Water Supply	Navigation	Other Uses	Land Use	Cultural Resources	Commercial Fisheries	Endangered Species	Habitats of Spec. Conc.	Air Quality	Recreation/ Tourism	Socioeconomic Factors	Subsis. Cultures
I-1	L	L	M	L	VL-L	L	L-M	L-M	L-M	M	L	L	VL-L	M
I-2	L	L	M	L	VL-L	L	L-M	L-M	L-M	M	L	L	VL-L	M
II	L	L	M	L	VL-L	L	L-M	L-M	L-M	M	L	L	VL-L	M
III-1	L	L	L-M	VL-L	VL-L	L	L-M	L	L	L-M	L	L	VL-L	M
III-2	L	L	L-M	VL-L	VL-L	L	L-M	L-M	L	L-M	L	L	VL-L	M
IV-1a	L	L	M	VL-L	VL-L	L	L-M	L	L	M	L	L	VL-L	L-M
IV-1b	L	L	M	VL-L	VL-L	L	L-M	L	L	M	L	L	VL-L	L-M
IV-2a	L	VL-L	L-M	VL-L	VL-L	L	L-M	L	L	L-M	L	L	VL-L	L
IV-2b	L	VL-L	L-M	VL-L	VL-L	L	L-M	L	L	L-M	L	L	VL-L	L

Average impact levels in all OCS Planning Areas

VH=Very High
H=High
M=Moderate
L=Low
VL=Very Low

would be likely to result in the lowest number of spills. Of course it must again be remembered that this schedule has fewer sales remaining than the proposed schedule, or any of the other alternatives, and therefore, the number of oilspills predicted would be lower but not directly comparable. Under this alternative 13.2 spills could be expected.

Environmental Impacts

A generalized comparision of the levels of environmental impact which could be expected to occur on an OCS-wide basis to the resource categories addressed in this document is presented in Table III-20. The table is a summarization of the impact tables which accompany the analysis of impacts of each Planning Area, for each alternative, in Chapter V. It presents an OCS-wide, average picture of the levels of environmental impact expected to result from adopting each of the alternatives, and illustrates the similarities and differences, by resource concern. The levels "Very High," "High" etc. are an aggregation of the conclusions presented in the impact tables. These levels are the collective judgements of the analysts who performed the impact analysis. Being subjective, the levels used in this table are unquantifiable, since accumlating impact levels among nearly 20 OCS planning areas results in comparisons of regions of vastly different character, and resources of different types. Since the impact indications are averages, one or more planning areas within each alternative may have higher or lower expected impact levels.

Ranking the alternatives according to impact potential is difficult because higher readings for a particular alternative in a particular resource category may be balanced by lower readings in another, making comparisons difficult. Alternatives I-1, I-2 and II are exactly the same, and have the highest collective readings, meaning that they have the highest impact causing potential, with their highest readings being moderate levels of impact OCS-wide to water supplies, habitats and Resources of Special Concern, and Subsistence Cultures. Any difference in scheduling between I-1 and II are not significant enough to cause more than localized differences and cannot appear in an OCS level evaluation.

Alternative IV-1.a and IV-1.b rank slightly below the first three because of lower readings in three reosurce categories. Impacts on navigation would be lower by a small degree because of the reduced number of sales in Alaska waters. The amount of reduction in impacts would not be enough to rank navigation impacts a full level lower (to very low) but analysts felt that there was indeed a reduction. Impacts to commercial fisheries would also be lower than expected in the first three alternatives, again mainly because of th reduced activity in Alaska waters. The lower level of OCS activity would probably also seve to reduce conflicts betwwen the oil and gas industry and native subsistence cultures in Alaska, ranking these alternatives lower for that impact level also.

Alternatives III-1 and III-2 rank lower than IV-1.a and b or I-1 because of lower impact levels in water supplies, naviagion, and commercial fisheries because of reduced levels of activity in many planning areas. Lower levels of impact are also expected to endangered species and habitats of special concern, due to the lower numbers of oilspills and offshore activity expected form these alternatives. Alternatives III-2 would rank slightly higher than III-1 because

impacts to commercial fisheries are expected to be somewhat higher because of the slight increase in activity expected in Alternative III-2.

IV. DESCRIPTION OF THE ENVIRONMENT

The information presented in this section supplements and updates parts of the description of the environment found on pages 93-142, Chapter III, in the FEIS. The OCS has been divided into six regions: Atlantic, Gulf of Mexico, Pacific, Southern Alaska, Bering Sea, and Arctic.

A. Atlantic Region

This region includes two planning areas, the North Atlantic and the South Atlantic. The former Mid-Atlantic is now included in the North Atlantic.

1. Geology

The Atlantic Margin is characterized by large-scale basinal features which formed primarily as a result of the break-up of two continents (rifting) in Triassic and early Jurassic times. The primary targets for petroleum exploration up to the present time have been the sedimentary basins which formed during Jurassic times. Rifting, followed by subsidence and the subsequent deposition of sediments has resulted in the accumulation of as much as 16 km of sedimentary material in the basins.

Industry interests is now focused on the sedimentary sequences underlying the Atlantic Continental Slope and upper Continental Rise. Here an ancient buried carbonate reef has been mapped (see Figure IV.c-1). It is covered by as much as 1000 ft. of sedimentary rocks and may be up to 10,000 ft thick and 15 miles wide. Conditions within the reef appear favorable for the generation and accumulation of petroleum resources.

The North Atlantic Region is structurally dominated by the Georges Bank Basin, a structural depression in the crystalline basement rock. Based upon seismic data 25,000 ft of Jurassic (and probably Triassic) through Quaternary sediments are present. Seismic records also reveal the presence of traps, reservoirs, and seals adequate for the entrapment of oil and gas.

Drilling in the nearest exploration province, the Scotian Shelf of Canada, has demonstrated that commercial quantities of oil and gas exist in that area. Production plans are now underway, most notably by Mobil Oil which is in the process of drilling delineation wells at one of their discoveries. Exploration drilling has also recently begun (July, 1981) within the Georges Bank Basin. As of December, 1981 drilling had been completed on Block 133 (water depth of 69 m) by Exxon. Tests indicated the well to be dry. Deepwater tracts being studied for possible inclusion in proposed Sale 52 will give industry a change to test the carbonate reef platform in the North Atlantic. Major potential geologic hazards or constraints present in the North Atlantic include large, migratory sand waves on Georges Bank proper (in water depths of 60 m or less) and possible presence of slumped material on the lower slope and upper rise. Localized slumping apparently occurs within the canyons proper.

The Baltimore Canyon Trough dominates the Mid-Atlantic Region. More than 15 km of Triassic and younger sedimentary rocks have been deposited in the trough. As of December, 1981 twenty-eight exploratory wells had been drilled in water depths ranging from approximately 50m to 200 m. This drilling on the Mid-Atlantic Shelf has produced twelve gas shows and one oil show, none of which have been considered commercial. Of all the Atlantic leasing areas, the carbonate sequence beneath the continental slope is best defined here. The OCST B-3 well, drilled on the fringe of the back-reef area (shoreward side), revealed the presence of hydrocarbons in the region. The primary target, however, would appear to be the fore-reef area (seaward side), where interfingering with black shale deposits has produced favorable structural traps. The primary geologic hazard present in the Mid-Atlantic is slumping. However, recent studies have shown that slumped material occurs in discrete, mapable entities and is not as prevalent as previously thought.

In the South Atlantic area, three primary sedimentary basins are present: the Southeast Georgia Embayment, the Carolina Trough, and the Blake Plateau Basin. Of these, the Southeast Georgia Embayment is considered a minor feature, having an overlying marine sequence which lies at depths less than 3200 ft. Although the COST GE-1 well indicated hydrocarbon resources may be

present in the area, to date six exploratory wells drilled in the Southeast Georgia Embayment have turned up dry.

The Carolina Trough and Blake Plateau Basin appear to be more suitable areas for generation of hydrocarbons. As much as 14 to 16 km of sediments may have accumulated in these basins. The seaward edge of the Carolina Trough is dominated by salt diapirism which, along with the associated fault features found both landward and seaward of the domal structures, may have formed favorable hydrocarbon traps. The carbonate reef is also present, although some breaks occur, in the seaward portion of the trough. The Blake Plateau offers the promise of a thick sedimentary sequence of probable marine origin. Stratigraphic traps and pinchouts against basement rocks are trap possibilities and seismic studies indicate that the carbonate reef and bank structures to the east could serve as reservoirs and traps. Marine environmental considerations to take into account in the South Atlantic are the presence of the Gulf Stream and its erosive nature, and the possibility of gas hydrates being present on the seaward edge of the Carolina Trough and Blake Plateau. Slumping may also be prevalent on the outer Blake Plateau.

In the South Atlantic, the COST No. GE-1 well is the first deep stratigraphic test to be drilled. The well was drilled within the Southeast Georgia Embayment to a total depth of 13,254 feet. Data from this well shows potential hydrocarbon reservoir units are present within the carbonates in the uppermost section, as well as in sandstone beds. While the carbonate section overall appears to be thermally immature, the upper half penetrated in the well shows the greatest potential. Sandstones are believed to be potential to a depth of at least 10,000 feet. No evidence of hydrocarbons has been established for this region; however, exploratory drilling as a result of Sale 56 will begin soon.

The Blake Plateau area offers the potential of a thicker marine section than is present in the South Atlantic area. The basement is covered by marine sedimentary rocks of Jurassic to Cenozoic age. The sediments above economic basement from a seaward thickening wedge terminated by a reef off the southern Blake Plateau and exceeding 14 km in the thickness beneath the southern Blake Plateau Trough. Stratigraphic traps formed by pinchouts, barrier islands, channel sands, etc., might be anticipated beneath the inner Blake Plateau. Some carbonate banks have been interpreted beneath the outer Blake Plateau; these, too, might act as hydrocarbon traps.

Geologic hazards include potential slumping and mass movement of sediments, particularly in areas of steep slopes associated with the upper slope and submarine canyons. Shallow gas deposits and active faults are other geologic features that exist in localized areas.

2. Physical Oceanography and Meteorology

The physical environment adjacent to the Atlantic coast is not a particularly harsh one. The relatively benign set of average conditions is occasionally punctuated, however, with extremes which may be considered limiting to offshore operations.

Surface winds play a critical role in determining the movement of spilled oil and other pollutants in the marine environment. Additionally, wind-driven waves may be the most serious weather-induced problem affecting shipping and offshore development. The prevailing surface winds over the region are from the west. Throughout the area there is a general shift to the northwest during the winter and to the southwest during the summer. Winds from the northeast usually present the greatest threat of severe weather to the offshore region. Foul weather is most common during the winter season (November to April).

Northeasters (extratropical cyclones) are more frequent and intense between October and April. Formation usually occurs between 30° and 40° N and within 100 miles of the coast, with maximum severity occurring between New England and Canada. Winds of gale or hurricane force can occasionally occur. The maximum sustained 100-year winds is 102 knots.

The northeastern United States is rarely affected by the passage of hurricanes. The South Atlantic coastal region has generally experienced tropical cyclones of one type or another

Cenozoic strata, probably mostly carbonates. Beneath these are the Lower Cretaceous beds, probably carbonate with some dolomite and evaporite interbedding. Conditions appear favorable for petroleum production, but water depths range around 1000 m. Phosphate deposits are known. Large areas of the surface are covered with manganese pavement and manganese modules. Vigorous erosion by the Gulf Stream occurs on the inner margin of the plateau, and slope-slumping, especially under storm conditions, is a possible hazard.

The waters and the bottom of the OCS provide habitat and food for a wide variety of organisms. Each general group is discussed briefly.

1) Phytoplankton

Recent phytoplankton studies have given primary attention to the estuaries and less to coastal streams and the shelf. Species composition, abundance, and seasonal patterns are fairly well known. In freshwaters the dominants are chlorophytes, in estuaries either dinoflagellates or diatoms, and on the shelf, diatoms. In estuaries dinoflagellates peak in late summer, and diatoms in the spring and fall. On the shelf over 600 species of phytoplankters are now known. In comparison with the cold waters above Cape Hatteras, the warm waters below the Cape show a greater diversity of diatoms and coccoliths and less seasonal fluctuations due, in part, to the stabilizing influence of the Gulf Stream. On the shelf productivity is greatest near shore, and it decreases further out. Special laboratory and field studies relate to nutrient requirements, pollution tolerance, and ground truth for satellite imagery. Additional work has been carried out correlating phytoplankton species and abundance with water masses and elucidating the roles of living and dead phytoplankton in food chains. Many phytoplankton collections are stored in various coastal laboratories.

2) Zooplankton

Zooplankton includes two groups, holoplankton (which passes its entire life history within the water column) and meroplankton (which passes only a portion of its life history, generally early developmental stages, in the water column). Both types are abundant.

Comparison of diveristy indices shows highest values at the ocean, lower through the estuary, and least at the upstream nursery areas. The presence of coastal species in estuaries tends to increase with increased flushing, due to up estuary transport in more saline bottom waters. Little recent work has been published on the distribution of shelf zooplankton except on the distribution of larval fishes. Spawning seems highly correlated with water temperature and little correlated with salinity. The Gulf Stream has a very complex zooplankton community, but neither the Gulf Stream nor the Sargasso Sea has been well studied off the Cape Hatteras - Cape Canaveral area. Limited information suggests that the mean zooplankton standing crop is about 0.03 cc/m^3 and that of the Sargasso Sea about 0.02 cc/m^3. In the Gulf Stream copepods make up over half the standing crop, and chaetognaths 15-25 % (by volume). In comparison with neritic waters, the offshore areas have a larger component of carnivores and fewer obligate herbivores. Offshore the zooplankters utilize most of the phytoplankton standing crop and efficiently transfer the energy to higher trophic levels.

Factors underlying spatial and temporal zooplankton distribution patterns have been examined in some cases. Estuarine and nearshore species show great seasonality in spawning and larval abundance, but this seems to be less the case for the strictly offshore species. Certain estuarine species with good swimming capability seem to spawn well onto the shelf where current patterns can disperse the larvae widely along the coast. Others with little mobility spawn closer to shore where the larvae have a good chance of entering the adjacent estuary but limited chance of being swept to more distant estuaries.

Some studies have been carried out on thermal shock and synergistic effects of temperature, copper, and salinity on survival of fish larvae. Copper exposure lowers the thermal resistance, and chlorine exposure lowers survival rate at both ambient and elevated temperatures. Zooplankton entrainment by steam electric plants seem not to have a major effect on estuarine zooplankton populations. Water from dredge disposal sites and sediment extracts has been shown to be toxic to certain zooplankton species.

3) Neuston

The term neuston refers to those organisms which live all or part of their life in association with the surface of the water. The depth of the neuston layer is subject to debate, and sampling gear effective for one group of organisms may have different depth penetration from gear effective for other groups. The most generally accepted depth range of the neuston layer is the upper 5-10 cm.

Extensive studies are underway to determine the seasonal and areal distribution of neustonic fish eggs, larvae, and juveniles over the shelf and slope of the region, and some of these results are already available. The reported catch includes representatives of 60 families belonging to 13 orders. Both tropical and temperate species are represented, showing the influence of the Florida Current. Warm temperate species were associated with the South Atlantic Bight shelf. Fair amounts of small tar balls and plastic particles are also routinely obtained in neuston samples. For example, tar lumps were present in quantities ranging from 0.7-96.9 mg/m^3, and they averaged over 20% of the wet weight of the neuston samples. The presence of tar balls is a ubiquitous neustonic component generated from various sources and generally concentrated by currents. Although natural seeps may be responsible, discharges and spillage from vessels at sea are common sources.

4) Marine Benthic Flora

At the present time, 352 species of marine benthic algae are known from the area of which 9% are blue greens, 51% reds, 16% browns, 3% goldens, and 21% greens. The algal flora is dominated by species of southern affinity, but some northern species are also present, especially in the vicinity of Cape Lookout. Probably none of the species are endemic. Most of the species are associated with marshes, estuarines, and nearshore marine substrates. Only one segment of the entire coast has been studied intensively, the stretch between Cape Lookout and New River Inlet, North Carolina. Recent studies have indicated a significant algal flora on offshore hard banks and rock outcrops, but this work is still in its infancy.

Recent studies have also begun in the laboratory to determine patterns of temperature and light favorable for the growth of individual species, and some work is underway on reproductive processes of several species.

5) Bacteria

Only a few studies have addressed the microbiology of the continental shelf. A transect off Cape Lookout, North Carolina, showed that in the water column the bacterial population was 19% greater offshore than inshore and that it accounted for 4%-25% of the phytoplankton carbon. Shelf sediment microbes (mostly *Pseudomonas* spp.) were found capable of degrading hydrocarbons when supplied with nitrate and phosphate. Ferromanganese nodules from the Blake Plateau were found to contain on their surfaces bacteria in concentrations of $6 \times 10^5/cm^2$. Few or none were at the core of the nodules. Studies have been carried out on the effects of hydrostatic pressure on RNA synthesis in a bacillus isolated from the Blake Plateau nodules. This species can synthesize much better at high pressures than can the standard bacterium E. coli. It has been found that bacteria from deep sediments can decompose hydrocarbons at *in situ* temperature and pressure, but that they can accomplish the same ten times faster under normal laboratory conditions. Some biochemical studies have been carried out with deep sea isolates.

(tropical storms, tropical depressions, or hurricanes) as early as May 28 and as late as December 3. Portions of the region near Miami, Charleston, and Cape Hatteras are the most likely to experience a hurricane in any one year.

Present frequence of periods of limited visibility is variable throughout the region. At Nantucket Shoals, July is commonly the month with the greatest percent frequence (47.5%) of fog that limits visibility to less than one mile. The frequency of fog occurrence is much lower in the southern portion of the region.

Throughout the South Atlantic Bight (SAB), the semidiurnal component dominates all other tidal components. In general, the tidal range tends to increase toward the middle of the bight reaching a local maximum (on the order of 2-3 m) in the vicinity of Savannah. The maximum range is approximately 0.9 m at Cape Hatteras and about 1.2 m at Cape Canaveral. Bottom pressure records collected off Savannah indicate tidal ranges of 100-240 cm occurring on a 28-day cycle at mid-shelf, and 60-190 cm at the shelf break. The coastal tidal range varied from 180-300 cm during the same period (Science Applications, Inc. (SAI), 1980).

Semidiurnal tidal currents which produce a significant fraction of the total current variability result from a wave which travels primarily in an onshore-offshore direction. At mid-shelf off Georgia, the cross-shelf component has higher amplitudes than the along-shore component. Also, a local maximum of tidal current amplitude occurs at mid-shelf.

Based on mechanisms controlling observed circulation, three generalized shelf flows can be identified: the outer shelf, where current variations are produced primarily by Gulf Stream forcing in the form of wave-like meanders and cyclonic spinoff eddies; and mid-shelf and inner shelf, where tide and direct wind forcing seem to account for most observed current variability. Between Cape Fear, North Carolina, and Jacksonville, Florida, where significant freshwater runoff creates a 10-20 km wide band of lower salinity water on the inner shelf, density-driven circulations may also be of importance. The lateral bounds of the outer shelf region tend to vary seasonally from the seaward one-third in winter to the seaward one-half in summer. This difference probably results because in winter horizontally stratified shelf water can form a density barrier to Gulf Stream intrusions. In summer, stronger vertical and weaker horizontal gradients allow Gulf Stream water to move further inshore.

At mid-shelf, tidal currents create about 40-70 percent of the total along-shore variance and 70-95 percent of the cross-shelf variance. Near the shelf break, tidal currents account for about 10-25 percent of the total along-shore current variance and 40-60 percent of the cross-shelf variance; low frequency (subtidal) fluctuations produce the remaining (SAI, 1980). The tidal amplitude of the cross-shelf component ranges from about +15-+50 cm/sec and has a cross-shelf maximum near the 45 m location. Near the shelf break, large amplitude current fluctuations (+40-+80 cm/sec) are produced by Gulf Stream spawned events such as wavelike meanders of the Gulf Stream front and cyclonic, cold-core, spin-off eddies.

Studies by SAI of the vertical distribution of mean flow conditions at various cross-shelf positions in winter and summer revealed a pronounced shoreward decrease in upper layer alongshore currents. No similar systematic pattern is seen in the cross-shelf flow. At all cross-shelf locations, lower layer currents are considerably reduced although consistent in direction with upper layer flows (i.e., to the north). At all stations the mean along-shore flow exceeds the mean cross-shelf flow. It is apparent from data collected that at subtidal frequencies the upper and lower currents are better correlated in winter than summer, which may result because of the increased vertical stratification in summer.

The Gulf Stream is the predominant oceanographic feature off the southeastern U.S. and plays a major role in mixing nutrient-rich waters with shelf waters.

Near the shelf break large amplitude current and temperature fluctuations (+ 40 - +80 cm/sec and +2° - +4°C, respectively) are produced by Gulf Stream spawned events such as wavelike meanders of the Gulf Stream front and cyclonic, cold-core, spin-off eddies. Energetic, broadbanded spectral peaks occurred in the subtidal data at periods of 2.5, 3.5, 5, and 10 days in the current, temperature, and wind time series during the winter in the study performed by SAI. At the shelfbreak, coherent along-shelf and cross-shelf current fluctuations with these periods appear to result from Gulf Stream meanders traveling northward in the upper layer along the continental margin. These lateral migrations of the Gulf Stream Western Boundary (GSWB) appear to be correlated to the wind at the dominant 2.5-3 day and 5-10 day periods.

These Gulf Stream frontal meanders may initially be wind induced due to offshore (onshore) surface transport associated with the south (north) winds during the passage of cold fronts. These surface transports can also produce upwelling/downwelling, respectively, which may be in phase with and can enhance that produced by the meander (see Figure III-8).

Current meter, hydrographic, and satellite sea surface temperature data show that the folded wavelike patterns commonly displayed in satellite imagery of the Gulf Stream boundary off the SAB are produced by the evolution of cyclonic, cold-core, spin-off eddies. Horizontal wavelike meanders of the Gulf Stream western boundary travel northward along the shelf edge in the upper layer. Due to the large horizontal and vertical shear in the frontal region, these distributions can become unstable and eventually grow into cyclonic spin-off eddies, which appear as tonguelike extrusions of Gulf Stream water flowing south over the shelf. The initial frontal disturbance appears at times to be wind triggered.

Currents on the inner shelf out to about the 35 m isobath are predominantly wind driven. Of course, tidal influence is also important. The significance of this fact is that it helps validate the oil spill model used to predict South Atlantic oil spill trajectories and risks.

These filaments of Gulf Stream water can, at times, extend well onto the shelf and can significantly affect observed surface currents. Material in close proximity but on opposite sides of a filament or Gulf Stream boundary can have widely divergent paths, with material in Gulf Stream water usually being transported rapidly to the north. Material in mid-shelf water has a long term trajectory more reflective of wind driven surface currents. Some evidence suggest that a bidirectional exchange can occur across a Gulf Stream front although movement of surface water into the Gulf Stream is the general pattern.

Eddies are advected to the north along the shelfbreak by the Gulf Stream at about the same speed as the meanders (average about 45 cm/sec). The signature of an eddy passage in current and temperature records from the shelf break is a cyclonic rotation of current vectors throughout the water column coupled to large decreases in near bottom temperature. During times of maximum southward flow, near bottom temperature may decrease as much as 6° due to upwelling in the eddies central cold-core that extends up along the slope and beneath the near surface extrusion of warm, southward flowing Gulf Stream waters.

Current meter data indicate that during the spring period spin-off eddies occurred at an average of about one per week, which was more frequent than either the winter or summer periods. Over the first 11 months of data, the average rate of occurrence was about one eddy every two weeks.

South of 32°N the Gulf Stream follows the 100 m isobath and east-west displacements of the front seldom exceed 25 km (Legeckis, 1979). North-south eddy dimensions in this region range

from 100-200 km (Lee, Atkinson and Legeckis, 1980). At 32°N a topographic feature known as the "Charleston Bump" (Brooks and Bane, 1978) causes the Gulf Stream to deflect eastward downstream of the bump forming a quasi-permanent meander (Pietrafesa, Atkinson and Blanton, 1978). Associated with this eastward meander is a region of active upwelling in the lee of the bump. Downstream of the bump meanders grow in size with east-west displacements reaching 100 km (Legeckis, 1979), and downstream dimensions of eddy filaments can elongate to over 300 km.

The Charleston Bump tends to deflect the Gulf Stream offshore so that between Charleston and the vicinity of Cape Fear, the GSWB is further offshore than at other locations in the SAB. As a consequence, the Gulf Stream, although still an important influence in driving outer shelf currents, is not as important as it is in regions to the south of Charleston. In the downstream shadow of the Charleston Bump, the cross-shelf zone, where wind forcing is a major factor, extends out to the shelf edge.

The Gulf Stream has a tendency to induce an upwelling on the downstream side of the Charleston Bump and is primarily the result of topographic influence. This upwelling would help explain the anomalous productivity found in that area.

Total water transport by the Gulf Stream through the Straits of Florida is approximately 32 x 10^6 m^3/sec and increases to approximately 63 x 10^6 m^3/sec by the time the Gulf Stream reaches Cape Hatteras. Current velocities along the length of the SAB in the axis of the Gulf Stream reach approximately 200 cm/sec. Measurements taken of bottom current on the Blake Plateau (Pratt, 1963) during June and July 1961 show speeds averaging 25 cm/sec. The Gulf Stream passes very close to land off south coast Florida. Depending on local wind conditions, Gulf Stream waters may have great influence on local nearshore surface circulation in this area. In mid-east Florida where the Gulf Stream tends to flow progressively further from shore, rather strong along-shore currents often dominate the inner shelf area flowing to the south, producing a complex circulation where influenced with tides and Gulf Stream boundary waters.

Along the coast where turbid estuarine water discharge meets offshore water, a very distinct interface can be observed. Previous studies suggest that around these fronts surface currents tend to converge toward the front. Thus, it is expected that floating material would accumulate on the front and be transported with the front as it migrates.

SAI, under contract to BLM, evaluated the effectiveness of the coastal front as a barrier to pollution by documenting and examining the behavior of floating and dispersed pollutant simulators. Using LANDSAT imagery to determine the presence and extent of Turbid-Clear Water Interface (TCWI) and knowing environmental factors, such as tidal stage, local meteorological conditions in a three-day window surrounding the documented conditions, and winds at the time of imaging, key parameters controlling the presence and extent of the TCWI can be isolated. The TCWI was clearly dependent on tidal state. Offshore fronts were seen when tidal currents at the mouth of the bordering estuaries were in the latter half of ebb and first half of flood. During the second half of flood tide and the first half of ebb, fronts were at best broken, irregular, or absent. Under certain conditions, strong winds apparently caused sufficient mixing to eliminate a sharp boundary in the images. Instead, a more diffuse turbid gradient existed.

Results of these studies suggest that fronts associated with tidally dominated estuarine discharge plumes may only act to temporarily delay pollutant migration. Even if fronts were readily maintained during all conditions, the fronts often move back into the estuary at some time during the flooding tide. If ambient along-shore shelf currents are sufficiently vigorous, a plume may become detached, but the embedded pollutant may very well be drawn into one of the other

tidally-dominated estuaries along the coast of the Georgia Embayment (Blanton, 1980).

During the winter months, waves greater than 20 ft. occur nearshore less than 2% of the time, and up to 5% of the time farther offshore. The median significant wave height (the 50th percentile) is approximately 4 ft. during the winter and 2 ft. during the summer. These relatively low wave heights do not eliminate the possibility of exceptionally high waves occurring from time to time. For example, in the mid-Atlantic region, once every 5 years a maximum wave height of 17.5 m can be expected, while once every 100 years one of 26.2 m can be expected. In the South Atlantic region, estimated maximum wave heights are somewhat lower than a 16 m maximum expected every 25 years and a 20 m maximum expected every 100 years.

3. Marine Habitats and Resources

a. General Description

Darnell (1979) has recently summarized what is known about the biology of the South Atlantic OCS, and the following discussion is taken largely from that.

A very brief description of the physical environment is necessary as background; the OCS of this area may be subdivided into three distinct zones, plus the Blake Plateau:

Cape Hatteras to Winyah Bay - Many patch reefs with heavy epifaunal growth occur within the bays, and algal reefs at the shelf break have been dated at 19,000-24,000 b.p. Although the subbottom stratigraphy is not well studied, several buried channels have been identified. Beach erosion is due largely to strong northeast storms. Sand and gravel are available in exploitable quantities, but there is no recent information on offshore phosphate, heavy minerals, or petroleum resources.

Winyah Bay to St. Johns River - Outcropping ledges and patches support heavy organic growth, and sand ridges are present. The subbottom exhibits buried irregular topography near the shelf break, and off the South Carolina coast tectonically active faults likely exist. Lower Cretaceous strata are believed to have the best hydrocarbon potential. Sand and gravel are present in economic quantities. The large Floridan Aquifer in Early Tertiary limestone extends offshore under the shelf, but due to heavy industrial use, it is being encroached by salt water. In Chatham County, Georgia, a large phosphate body exists onshore and offshore. This subzone is subject to considerable earthquake activity and possibly shifting deep-shelf sediments, especially during periods of heavy storm activity.

St. Johns River to Cape Canaveral - Rock outcrops with heavy organic growth occur off Cape Canaveral, and algal ledges are found along the outer shelf and upper slope. Linear shoals and terraces off Cape Canaveral probably represent Holocene marine transgression features. Sinkholes and other karst features in the cavernous Tertiary limestone are present but poorly known. Subbottom profiles identify tectonic ridges of Cretaceous strata under the mid-shelf off Jacksonville, and Miocene ridges under the shelf off Daytona Beach. Surface sediments, derived from Tertiary and Pleistocene deposits, are being actively reworked, and the finer fractions are being transported landward. Possible petroleum reservoirs exist in Jurassic and lower Cretaceous beds. Shelf sands provide an excellent potential source of beach fill, and the Floridan Aquifer extends beneath the shelf. Some phosphate deposits are known.

Blake Plateau - Coral mounds and ridges with greater than 100 m relief are known, and they are particularly numerous beneath the Gulf Stream. Some are currently active. Surface erosional features are known. The surface of the plateau is Miocene sediment overlain with a veneer of fine-grained carbonate Holocene sediment. This lies upon Upper Cretaceous and Early

6) Benthos

Biogeographic affinities of the benthic fauna are complex and not completely understood, but the following patterns seem to be emerging. The estuarine fauna south of Cape Hatteras is fairly similar to that north of the Cape, and the two together form a single Atlantic estuarine fauna. The fauna of the high salinity reaches of bays, estuaries, and outer beaches has more definite southern affinities, and few of the species in this group have established permanent populations north of Cape Hatteras. The offshore shelf benthos is even more southern, and on the Gulf Stream-influenced outer shelf it grades into a tropical fauna, especially in association with hard bottoms. Benthic biota of the slope, however, appears less affected by the Gulf Stream or the Hatteras barrier. Most slope species appear to range broadly north and south of the area in distributional bands marked by critical depth/temperature ranges.

Habitat distribution of macrobenthic invertebrates has received recent attention, and it seems clear that salinity characteristics and substrate properties together account, in large measure, for observed distribution patterns. Few recent studies have been completed on the macrobenthos of the continental shelf. There is evidence that some species show rather regular seasonal fluctuations while others are more erratic in space and time. The offshore scallop beds in 20-25 m of water are associated with a unique benthic fauna, and the scallop populations seem to be controlled by predators (especially, the starfishes *Astropecten* and *Luidia*).

A great deal of recent work has appeared dealing with the meiobenthic fauna. These animals pass through sieves of 0.5 mm mesh size, but they are retained by 0.063 mesh sieves. This fauna is dominated by nematodes and copepods. These organisms are especially abundant in shallow water habitats. Most species require coarse sand substrate where the interstitial species predominate. Information is becoming available concerning seasonal population fluctuations, breeding seasons, nutrition, physiology, depth distribution, and resource partitioning.

The distribution and abundance of meiofauna on the continental shelf has been examined by several workers. In general, the meiofauna is most dense on the inner shelf (13-15 m), but there is another peak density in deeper water. In one transect off North Carolina the depth/density relationship appeared as follows: 400 m-440/10 cm^2, 800 m-892/10 cm^2, 4,000 m-74/10 cm^2. Down to 500 m nematodes dominate, but below that depth foraminiferans are more abundant, and these are especially important between 1,000 and 2,000 m. Nematodes reached greatest abundance on the inner shelf and copepods were most abundant in the coarser sands of the middle and outer shelf. A definite faunal break appears at a depth of 400-600 m of Cape Lookout and slightly deeper (500-750 m) further south, off Cape Fear. This break is associated with a shift in sediment types. Above the break the sediments are coarser, being made up of quartz and calcareous sands, whereas below the break the sediments are silty sands and clays. The water below the break is also colder, being less than 10°C. Below 1,000 m nematode species diversity was low, but that of benthic copepods was high.

Functionally, the benthos plays several important roles in the metabolism of coastal and marine systems. By mineralizing wastes and organic detritus, they provide nutrients for primary production. By packaging nutrients and energy into their own bodies, they support, in part, the higher trophic levels. In both cases they aid the microbes in regulating the rates of turnover of materials and energy in the marine biogeochemical cycles. Estuarine studies clearly show the importance of benthos as food for fishes, but few food studies have been carried out on the shelf species. Recent studies have also demonstrated the importance of benthic species in processing and ventilating bottom sediments. In estuaries bioturbation dominates sediment structure in all but most physically active sedimentary environments, and some cases surface ½ cm may get reprocessed as much as four times per year. Such processes mix, ventilate, and irrigate the sediments and greatly facilitate chemical exchange between sediments and the water column.

Recent studies have also demonstrated the rapid recruitment of opportunistic benthic species onto new bottoms created by dredging activities.

7) Nekton

Nekton includes the larger free-swimming aquatic animals. In the present context it has been taken to include all fishes as well as squids, scallops, shrimp, lobsters, and crabs. Planktonic larvae have been treated as zooplankton.

Since the region includes a wide variety of highly productive coastal habitats, there is a rich diversity of nektonic species. Some spend their lives in one habitat or another, but a great many pass different life history stages in different habitats and, therefore, must engage in seasonal migrations. Some of the marine species (such as the herrings, shad, striped bass, alewives, and Atlantic sturgeon) are anadromous and migrate upstream in the rivers to spawn. Others (such as penaeid shrimp, blue crab, and many fish species) spawn largely on the shelf, but are estuarine dependent and pass their juvenile stages there. Yet others spend their entire lives on the shelf but move inshore during the summer months and offshore during the winter. In addition to these migrators and year-around residents of particular habitats, the region is also visited by numerous species associated primarily with the Gulf Stream. Prominent among these are the large predatory billfishes, tunas, mackerels, wahoos, dolphins, and jackfishes.

For the invertebrates most of our knowledge of composition and seasonal abundance relates to commercially important species. About 95% of the offshore catch is made up of brown and white shrimp, and the remainder includes royal red, pink, and rock shrimp. American lobsters, which are occasionally caught north of Cape Hatteras, do not enter warmer waters south of the Cape. A large population of rock shrimp inhabits the shelf off Cape Canaveral. A large fraction of the commercial shrimp catch comes from the open bays and sounds, and the Pamlico Sound catch represents about half the North Carolina shrimp landings. White shrimp predominate, although large quantities of brown shrimp are also taken. A number of species of squids are known from the shelf, and limited information is available concerning their distribution in terms of depth and temperature.

A small amount of information is available concerning relative biomass of fish species in trawl catches. In a survey from Cape Fear, North Carolina to Cape Canaveral, Florida, the catch over four seasons ranked as follows: roughtail stingray-45.5%, porgies (*Stenotomus* spp.)-15.7%, bullnose ray-6.0%, and orange filefish-5.5%. All other species were less than 5.0% each. Relative biomass estimates from trawl surveys in South Carolina estuaries include: star drum-19.3%, Atlantic croaker-17.4%, spot-10.4%, white catfish-9.9%, silver perch-8.0%, and weakfish-5.7%. All other species made up less than 5.0% each. A total of 88 species was taken.

Various types of migration patterns are known, and some of these are under study. Larger Gulf Stream species annually migrate from the tropics to Canada and back, and they may circle the north Atlantic. Other species show major seasonal migrations along the coast (some going from Florida to Long Island). Many show shorter latitudinal migrations, and a great may exhibit onshore-offshore movements. Such migrations are often associated with specific life history stage, feeding and spawning.

b. Habitats and Resources of Special Concern

The fish fauna of the western Atlantic represents a resource of particular concern. Many species of fish have planktonic eggs and most have planktonic larvae. Spawning is concentrated nearshore in shallow, inshore areas of estuaries and embayments and offshore

on relatively shallow coast and bank areas. Several important species, yellowtail flounder, American plaice, silver hake, Atlantic mackerel and red hake among them, spawn over long periods of time in large areas of the western Atlantic. For some species, spawning results in an aggregation of fish in small, well-defined areas. Anadromous species are a good example.

Most fish in the western Atlantic spawn from late winter to midsummer, often beginning in the more southern reaches of the area and proceeding northward. For fish spawning over wide areas, as much as several months may be involved to complete spawning from the southern to the northern extremes. The planktonic period (through the egg and larvae stages) may last as long as 5 months, depending in part upon water temperature. For most species, specific geographic sites are not selected consistently every year for spawning. Rather, the location of most intense spawning and the areal extent varies annually.

Perhaps 34 species of pelagic birds are found in the Mid-Atlantic and New England areas, with as many as 30 of these species common to both. The largest concentration of pelagic birds are found in upwelling areas and areas of high productivity. These areas may also have high commercial fishing value, such as Georges Bank. Several species of pelagic birds breed in the North Atlantic area, including razorbill, common puffin, black guillemot, Leach's petrel, artic tern, great black-backed gull and herring gull. The major nesting colonies are concentrated along the offshore islands off the coast of Maine.

There are 7 endangered species of marine mammals occurring in the Atlantic: the blue whale the fin whale, the humpback whale, the right whale, the sei whale, the sperm whale and West Indian manatee (South Atlantic only). Endangered turtles are: the hawksbill, which is rare in the mid- and north Atlantic; the leatherback, the Kemp's Atlantic ridley, the green turtle, and the loggerhead turtle. Coastal endangered species include the bald eagle and peregrine falcon, and in the South Atlantic only, the brown pelican and everglades kite.

At least 190 canyons dissect the slopes between Labrador and Cape Hatteras and their distribution conforms closely to the proximity of the Wisconsin ice sheet. Biologically, the canyons appear to be especially productive in both pelagic and benthic habitats. They act as channels between the upper shelf and the ocean floor, and as such may act as a potential pathway for flow of materials, including nutrients and pollutants.

Canyons tend to be more diverse biologically in terms of trophic types of the organisms present. Various species have discrete depth ranges, while others are not so narrowly confined. In general, there is a pattern of gradual species replacement with increasing depth. Corals, both alcyonarians and scleractinians, can be found in many of the canyons as well as in deep slope areas.

Live bottom areas are defined as those areas which contain biological assemblages consisting of such sessile invertebrates as sea fans, sea whips, hydroids, anemones, ascidians, sponges, bryozonas, for corals living upon and attached to naturally occurring hard or rocky formations with rough, broken, or smooth topography, or whose lithotope favors the accumulation of turtles, fishes, and other fauna. These areas have been considered to be sufficiently unique and sensitive to require protection from the possible deleterious effects of oil and gas drilling operations. In general, the South Atlantic area live bottoms are small scattered areas of broken relief offering a hard substrate for benthic organisms, but in some cases may be smooth with a thin veneer of sand covering. The broken relief areas seem to harbor greater numbers of organisms than the smooth areas. The locations of such areas are not known with the precision necessary to afford them protection from oil and gas exploration and development activities; therefore, a stipulation has been developed to ensure that such areas, if any are present, within each leased block are located prior to beginning any activity which might damage them, and that appropriate restrictions are placed on the lessee to protect these areas.

The following brief discussion of live bottom areas is taken from Continental Shelf Associates (1979): "Hard bottom areas may either outcrop on the seafloor or be covered by a veneer of sand of variable thickness. Rocky outcrops are probably always covered with epifauna and have an associated fish population (live bottoms) though the quantity and quality may be quite variable. The hard bottoms that are covered by a veneer of sand may also support a variable biomass and number of species depending on the thickness of the sand layer. If the sand layer is too thick the area would not support an attached epifauna (barren sandy bottom), but if the layer is thin, a relatively large number of attached biota and fish may be present (live sandy bottom).

"There are a number of reports of hard bottoms, live bottoms, patch reefs, black rocks, fishing banks, snapper banks, limestone reefs, and algal reefs occurring on the continental shelf between Cape Hatteras, North Carolina and Cape Canaveral, Florida, but very few of the investigations have included sufficient sampling to fully characterize the areas. The hard bottoms have been described in terms of inner, middle and outer banks."

The inner shelf live bottoms are reported to lie between Jacksonville, Florida and Charleston, South Carolina in water depths of approximately 15-25 m. In a study involving an inner shelf hard bottom area, Hunt (1974) investigated an area of approximately 41 square kilometers in about 20 m of water located 33 km (18 nmi) east of Sapelo Island, Georgia. The study site was previously known as "Sapelo Reef," but was renamed "Gray's Reef" by Hunt. The site was studied using a recording fathometer, side scan sonar, subbottom profiler, and underwater television. Samples were collected with dredges and additional samples were collected and observations made during 11 SCUBA dives. The exposed reef areas were described as an interfingering series of northeast-southwest trending ridges and troughs. The rock outcrops, which did not exceed 6.6 m in relief, had a discontinuous distribution and sand ranging in thickness from a few to 30 or more centimeters covered some of the low relief rock areas. Shallow hard bottom areas (4-17 m) have been reported less than 10 nmi offshore of New River Inlet (Onslow Bay), North Carolina and Little River (Long Bay), South Carolina. The investigated hard bottom areas ("Black Rocks") were composed of a base of Trent Marl with *Vermicularia spirata* (gastropod) and tubiculous polychaetes forming a reefal cap. A hard bottom area in 16-24 m of water has been reported off Charleston, South Carolina. The bottom was described as generally being flat sand underlain at varying depths by rock which occasionally protruded as rocky patches or low ledges of up to 30 cm relief. The rock was a tightly cemented limestone conglomerate of carbonate shell and quartzsand material. Additional references to hard bottom areas in the nearshore zone include: (1) lithified to semi-consolidated rocks in 18 m of water off Georgia ("Gray's Reef"); (2) conglomerate rock ("coquina") located in 10-18 m of water off Cape Lookout, North Carolina; (3) Pleistocene outcroppings in Onslow Bay, North Carolina; (4) an outcrop of rock with 5 m of relief in 23 m of water; (5) major coral patches in 19-40 m of water in Onslow Bay, North Carolina; and (6) a well defined system of rocky ledges lying in 20-30 m of water off the east coast of central Florida.

The middle shelf hard bottom areas are thought to extend from Jacksonville, Florida into Onslow Bay, North Carolina, in depths of 30-40 m. Rock outcrops with up to 7 m of relief in 45-55 m of water off the central east coast of Florida have been reported. A major outcrop area of phosphatic limestone is believed to extend from off Cape Fear to Cape Lookout (Onslow Bay), North Carolina, based on lithoclasts from sediment samples. The sediment cover over consolidated Miocene sediments in Raleigh (North Carolina) and Long Bays (South Carolina) is relatively thick with few outcrops occurring in contrast to Onslow Bay. Hard bottom areas are present off Charleston, South Carolina, in 27 m and 37 m of water and possibly off Jacksonville, Florida, in 26 m of water based on biota collected in trawls. Three types of hard bottom have been described: the morphotypes were (1) low-relief hardgrounds, (2) moderate-relief reefs, and (3)

shelf-edge reefs. The low-relief hardgrounds were described as having less than 0.5 m of relief which made them susceptible to covering by a thin veneer of sand. Features with relief between one-half and two meters or more were termed moderate-relief reefs. The density of hard bottom areas appears to be the lowest off the central coast of Georgia as compared to northern Florida and South Carolina. A hard bottom area in 29-32 m of water off Charleston, South Carolina, has been described. The substrate is composed of sand with rock patches and low relief ledges protruding through the sand. The sampled rock is a limestone conglomerate of carbonate shell and quartz sand. A television camera was used to view 128 randomly selected stations in water depths ranging from 27-183 m between Cape Hatteras, North Carolina, and Cape Canaveral, Florida. Live bottom (hard bottom) based on the observations was estimated to comprise 23.3% of the shelf while live bottom with more than 1 m of relief was estimated to cover approximately 7.4% of the shelf. The occurrence of the discontinuous inner and middle shelf hard bottoms appears to be primarily related to acoustically reflective hard layer(s) which outcrop in erosional or non-depositional areas. A greater thickness of surficial sediments probably covers the inner shelf layer, which may be similar in size and lithology to the "Gray's Reef" substrate, resulting in a smaller amount of hard bottom than that in middle shelf areas.

The outer shelf banks or reefs are a discontinuous series of ridges and ledges in 50-80 m of water that parallel the shelf break and are found from Cape Hatteras, North Carolina, to Cape Canaveral, Florida. Shelf-edge prominences which vary in morphology, organic composition, distance from shore, and water depth are also found from Cape Canaveral to Key West, Florida, in depths from 70-110 m. Several shelf-edge (rock) ledges with reliefs of 5-10 m have been found off Georgia. A discontinuous algal reef approximately 150 km (80 nmi) in length that was located in 80-110 m of water and parallel to, though slightly seaward of, the shelf break has been reported off North Carolina. Two distinct types of rock were dredged from the reef: (1) algal rock that included "lithothamnion balls" (coralline algal nodules formed principally by *Lithothamnium*) and consisted of a framework of calcareous algae and lesser amounts of bryozoans and worm tubes, and (2) coquina rock. A series of terraces have been described at various depths on the shelf between Cape Lookout, North Carolina and Miami, Florida. The terraces which showed little correlation to the shelf edge, were the result of lowered stands of sea level. The shelf edge from Cape Hatteras, North Carolina to Miami, Florida, have a discontinuous series of low relief (less than 10 m) ridges, perhaps of algal origin. Lithified to semiconsolidated rocks up to 1 m in diameter and encrusted with calcareous growth and partially covered by sand-size material have been observed in 50-70 m depths. Four ridges with relief of up to 10 m and intervening sediment filled troughs have been described on the outer continental shelf off Cape Hatteras, North Carolina. Troughs, terraces, and poorly defined ridges parallel to the shelf break (50-80 m) have been described at depths of 50-150 m between Cape Hatteras and Cape Fear, North Carolina. The shelf-edge topography from Cape Fear, North Carolina, to Cape Canaveral, Florida, was described as mainly smooth and undulating with a generally indistinct shelf break. Ledges with 6-10 m of relief and rises with less than 5 m were occasionally noted at depths of 50-70 m while terraces were seen in 70-110 m of water. Dredge samples indicated that the veneer of the rock outcrops along the shelf break were composed of algal limestone, quartz-rich calcarentie, and calcereous quartz sandstone. South of Cape Canaveral the shelf break was reported to be significantly shallower with ridges and ledges continuing. The shelf-edge features between Cape Hatteras, North Carolina, and Cape Canaveral, Florida, appear to be primarily algal ridges that were formed by relict calcareous sources deposited during lower stands of sea level and mainly during the Holocene transgression. The coralline algal limestones and calcareous sandstones which were dredges from certain shelfedge features are believed to have formed a veneer over buried pre--Holocene Gulf Stream erosional surfaces. The features were not the result of unique constructional processes but were present primarily because they existed in areas of low deposition and were therefore not buried under recent sediments. The structure of many shelf-edge features in southern Florida and the Gulf of Mexico also seems to be related to the Holocene transgression. However, other shelf-edge banks in the Gulf of Mexico have resulted from vertical salt intrusions.

The benthic organsims of these areas are in large measure the reason for concern for live bottoms. These organisms are sessile and provide food and habitat for larger pelagic animals important to commercial and sports fisheries. Some organisms, such as corals and coralline algae, are active reef builders. The following brief description of the benthic biota is again largely from Continental Shelf Associates (1979):

A hard bottom area ("Black Rocks") in 4-7 m of water is located less than 18.5 km (10 nmi) off New River Inlet, North Carolina, and Little River, South Carolina. Over 400 faunal species were recorded from the hard bottom of which 74% were described as southern ranging species. The taxa which showed the most predominant southern affinities were sponges, ascidians, bryozoans, decapods, polychaetes, mollusks, amphipods, and echinoderms. The faunal community associated with the coral *Oculina arbuscula*, is only known from Cape Hatteras, North Carolina, to Charleston, South Carolina, in depths of 3-25 m. Coral heads were collected from three jetty areas (Cape Lookout, Beaufort, and Charleston) and from water depths of 10-18 m off Cape Lookout, North Carolina. *Telesto fruticulosa, Titanideum frauenfeldii* (octocorals), and *Trachygellius cinachyra* (sponge) were also found off Cape Lookout. Hunt (1974) reported that soft corals, sponges, ascidians, bryozoans, barnacles, and algae were the predominant epifauna on "Gray's Reef" located in 20 m of water off Sapelo Island, Georgia. Two species of ascidians, five species of sponges, and six species of anthozoans were identified. Areas of abundant growth were said to be associated with exposed rock, moderate growth with rock thinly covered by sand, and sparse growth with rock covered by up to 30 cm of sand.

On the rock outcrops of Onslow Bay in 20-40 m of water there exist two species of hermatypic corals (*Solenastrea hyades* and *Siderastrea siderea*). Specimens of *Solenastrea hyades* were reported to be quite healthy despite exposure to water temperatures as low as 10.6°C and probable high turbidity while specimens of *Siderastrea siderea* were generally in poor condition. Four species of hermatypic corals have also been reported from Onslow Bay and include *Astrangia astreiformis, Ballanophyllia floridana, Oculina arbuscula,* and *Phyllangia americana.* Coral heads, sea fans, algea, and sponges characterized the "coral patches". The majority of the algae off Onslow Bay is believed to have centers of distribution for the western Atlantic in the Carribbean Sea. Sixty-six percent of the offshore species were said to reach their northern limit of distribution in Onslow Bay and 33% were said to be found both north and south. Sixty species of invertebrates have been collected with an otter trawl from two hard bottom areas off Charleston, South Carolina, in 27-37 m of water. Although soft corals, sponges, and ascidians were mentioned in addition to *Oculina* sp., no species list was available at the time of this writing. Three hard bottom areas in 16-24, 29-32, and 32-37 m of water off Charleston, South Carolina, have been described. Attached epifauna were observed in the two shallower areas (no visual observations were made in the third area) even when up to 8 cm of sand covered an underlying rock layer. The epifaunal assemblage in the observed areas was reported to be dominated by sponges and soft corals with algae and hard corals occasionally present. Five species of sponges, three octocorals, and two scleractinian corals were identified from the two shallower areas.

Approximately 170 species of invertebrates (107 identified) were collected with a small biological trawl in the vicinity of an "algal reef" in 80-110 m of water off Onslow Bay, North Carolina. Three trawl stations were located on the reef, one shoreward of the reef, and one seaward of the reef. Seventy-six percent of the identified fauna were collected from the reef stations with mollusks (45 species) and anthropods (34 species) numerically dominating the samples. Ninety-one percent of the identified taxa were considered to have northern ranges. The coral Oculina is present on shelf-edge features off north Florida, and the shelf-edge fauna off Sebastian and St. Lucie Inlets, Florida, is a coral *(Oculina varicosa)* - bivalve *(Barbatia candida)* - echinoderm *(Ophiothrix angulata)* assemblage. Eight taxa of anthozoans, 32 of decapods,

8 of echinoderms, 16 of (living) mollusks, and 26 of bryozoans were identified from dredge samples.

Many of the studies involving the hard bottom associated invertebrates have reported that the majority of the epifauna is derived from more tropical waters. It has been suggested that the tropical species are introduced by the northern flowing Gulf Stream. Although it appears that a large percent of tropical species can survive as far north and inshore as Onslow Bay, North Carolina, with the spatial extent of the assemblages dependent on the availability of a hard substrate, the reproduction of the various tropical species at the northern edge of their range has not been investigated. Thus, the soft bottom shelf fauna from Cape Hatteras to Cape Canaveral appears to be mainly Carolinian while the hard bottom fauna is primarily Tropical.

Stetson et al. (1962) have described living deep-water coral reefs on the Blake Plateau some 165 miles southeast of Charleston, South Carolina. Ayers and Pilkey (1980) have also described coral areas on the Blake Plateau. Water depths range from 475-600 m. Little is known about specific locations of individual areas of living coral, and the Ayers and Pilkey study used bottom profiles to make judgments regarding the presence of coral reefs; many of these may be relict reefal outcrops rather than presently living reefs. Nevertheless, it is clear that living deepwater corals do exist in this area; thus the following, taken largely from Ayers and Pilkey, is of interest: *Lophelia prolifera* and *Enallopsammia profunda* are the only two species of colonial coral recovered from the plateau. In addition to the colonial species of coral, the solitary species *Bathypsammia fallosocialas, Thecopsammia socialis, Bathypsammia tintinna balus*, and *Concentrotheca laevigata* were also identified in subsamples from the plateau. Not all corals on the plateau were associated with coral banks. Many living corals were recovered from the northern end of the study area attached to large phosphorite gravels and pavements.

The framework of the coral areas are the two species of ahermatypic and colonial coral. Coral banks occur on the plateau primarily in linear groups although isolated banks were also observed. In Stetson's study area the individual banks average 0.5 miles in diameter and occur in groups of 200 or more. The largest bank described by Stetson et al. (1962) is 480 feet high. Banks on the inner plateau described by Ayers and Pilkey are of lower relief, the highest being 300 feet. However, the areal extent of the group of banks on the inner plateau is much larger.

Factors controlling the distribution of these deepwater corals are not well known. It is likely, however, that at least the three factors influence the location of coral banks on the Blake Plateau. The optimum water temperature for deepwater corals varies but is always below the thermocline. Near bottom water temperatures at sites on the Blake Plateau where living corals were collected range from 6.0-12.0°C. Stetson et al. (1962) report bottom water temperatures near the coral banks that range from 7-10°C. Strong bottom currents are also needed to: (1) supply the coral with plankton; (2) keep the polyps clean of fine sediments; (3) help remove metabolic wastes; and (4) help provoke the growth and distribution of the coral banks. Finally, there must be a clean hard surface where the coral larvae and living coral branches that are broken off the main colony can attach and grow. Stetson et al. (1962) suggest the attachment surfaces on the Blake Plateau are outcropping lithified carbonate rocks. Evidence here suggests that on the inner plateau the attachment surface is typically the surficial cover of Miocene phosphorite gravels and pavements. Phosphorite gravels and pavements recovered from the plateau often have solitary and colonial corals attached. These gravels and pavements act as "hardgrounds" like those found on the shelf, serving as an attachment surface not only for the corals but also for bryozoans, sponges, and worms.

A scenario is suggested by Ayers and Pilkey that would explain the dramatic difference in the relief of the coral banks on the inner plateau that were described by them and those banks described further seaward by Stetson et al. (1962). The banks described by Stetson et al. were

located beneath a former course of the Gulf Stream while the banks described by Ayers and Pilkey lie beneath the present course of the Gulf Stream. The meandering flow of the Gulf Stream periodically crosses the coral banks causing the breakdown of the colonial corals. In this manner the frequency with which the Gulf Stream meanders across the banks controls the height of the banks. The banks studies by Stetson et al. (1962) are no longer subjected to the strong Gulf Stream bottom currents and can therefore grow to much greater heights. Radiocarbon dates of colonial corals from the plateau indicate the corals have existed on the inner plateau at least since Late Pleistocene time.

The most serious potential impact to the shelf biota described above is considered to be the direct mechanical damage to benthic communities that could be caused by drilling rig and platform placement, anchors, and pipeline emplacement. The stipulation discussed in Section IV.A. 3.c. is designed to prevent such potential damage, and in addition pipeline routes will be carefully chosen to have a minimal impact on live bottom areas.

The potential impacts from oilspills will be largely confined to the upper few meters of the water column and would not affect benthic communities except in shallow near-shore areas which are unlikely to be reached except by oil which has been weathered and is thus less toxic. The plankton entrapped by oil will be severely damaged, perhaps even totally killed, but unless the spill is a massive one it is unlikely that a significant fraction of any species or community, or even year group (in the case of eggs and larvae) would be affected. This small impact would be limited to the area of "fresh" oil which forms slicks, since weathered oil, besides becoming less toxic, tends to form discrete clumps and so would not cover the entire water surface of the area.

Thus, it is concluded that the impacts to shelf biota of this proposed sale will, even under worst case conditions, be minor and extremely localized, to the point of being insignificant in ecosystem terms, provided that the proposed stipulation is imposed.

The coral reefs offshore Southern Florida form a discontinuous arc, 195 miles long from Dry Tortugas to Fowey Rock (near Key Biscayne). These coral reefs represent the only such ecosystem bordering continental North America. Although isolated coral heads are found throughout the area (approximately 800 sq. miles), true living coral reefs are concentrated on the Outer Continental Shelf. The coral reefs occur as linear ridges along the western boundary of the Florida Current, or as patch reefs located landward of the barrier reefs. These reefs of the Keys are not actually within any of the sale areas; thus, the only potential impact to these reefs from offshore oil and gas activities would result from an oil spill. The likelihood of any spill occurring and reaching these areas while the oil is still unweathered and thus toxic is quite small. There are two small National Marine Sanctuaries established within the Keys' ecosystem: Looe Key and Key Largo. Two other small sanctuaries have been established in the South Atlantic area: Gray's Reef and the Monitor.

4. Other Uses of the OCS

a. General Description

Oil and gas operations in the Atlantic OCS will compete with many other uses of the marine environment. In the open shelf waters the competition will be: 1) with shipping, for which designated traffic lanes have been proposed by the Coast Guard for ships approaching the heavily used ports; 2) with commercial fishing, space use and fishing gear damage are issues of conflict, likewise the loss of catch due to oil spills is a point of concern; 3) with recreation along the many heavily utilized sandy beaches from Cape Hatteras to Key Biscayne; 4) with onshore infrastructure development in coastal ports and in the heavily populated Mid-Atlantic upland regions, the effects on air and water quality will be issues of concern; 5) with DOD and NASA operations conducted offshore; and 6) interim ocean dumping sites in use along the Atlantic coast.

b. Uses of Particular Concern

To minimize shipping conflicts in the South Atlantic area traffic separation schemes (TSS) have been implemented by the Coast Guard and recognized by the Intergovernmental Maritime Consultative Organization (IMCO) to aid in the prevention of collisions in the vicinity of major harbors. An additional vessel control scheme has been proposed by the Coast Guard and is under consideration by the Army Corps of Engineers. Termed Port Access Routes (PAR's), these navigation lanes will extend seaward from the present termination of the traffic separation lanes of the TSS system out to the 1000 fathom contour. The concept would consist of four parallel lanes, two of which would be used for traffic (one for inbound and one for outbound vessels) for a period of two years. The area crossed by the other two lanes of the system would be available for OCS development including the siting of exploratory rigs during the period. At the end of the two years the lanes would reverse allowing exploration activity in the lanes previously restricted to ship traffic. Public hearings were conducted in late November 1978 on the PAR concept but no final decision on implementation has been taken.

Commercial fishing contributes significantly to the economics of the South Atlantic area. In 1980 landings for the South Atlantic and Chesapeake totaled about 1.2 billion pounds, worth about $278 million (USDC, 1981). Some of the more important finfish and shellfish landed from the Atlantic south of the Chesapeake area, include shrimp, scallops, oysters, menhaden, spiny lobsters, blue crabs, and food finfish such as king mackerel, spanish mackerel, black mullet, gray seatrout, and croaker. Some of the more important finfish and shellfish landed from the Chesapeake area include alewives, clams, blue crabs, American lobster, menhaden, oysters, sea scallops, and food finfish such as croaker, striped bass, bluefish, and gray seatrout.

In 1970, the Atlantic coast was the most important region of the country as far as marine recreational fishing participation and catch were concerned. As a region, it accounted for over 50 percent of the number of anglers and 57 percent of the total number of saltwater fish caught throughout the nation. Generally speaking, inshore waters (sounds, rivers, and bays) and offshore waters supported equal levels of fishing activity, but a greater share of the catch was caught in inland waters.

The abundance of inlets, bays, sounds, and large estuaries along the Atlantic coast provided an ideal setting for fishing opportunities from private craft, which was the most popular mode of fishing along the Atlantic in 1970. Indeed, the dominant target species of the region included those inhabiting shallow coastal waters. There was, and still is, considerable interest in pursuing highly prized oceanic gamefish such as bluefin tuna, marlin, and sailfish, but these constituted a rather small portion of the total catch in 1970.

The South Atlantic marine environment is of particular recreational interest to sports fishermen and a small but growing number of scuba divers. Over 300 boat-for-hire businesses extending all along the southeastern seaboard cater to recreational fishermen. Some of these fishermen troll for big game or billfish such as marlin and sailfish associated with the offshore waters, but the greatest proportion of deep sea fishermen seek out the snapper, grouper, black bass, porgies, and grunts directly associated with the natural and artificial reefs of the continental shelf and the mid-water predators (cobia, mackerels, jacks, baracuda, and sharks) found in the same locations. Marine sanctuaries, especially the newly established Gray's Reef Marine Sanctuary off the coast of Georgia and Looe Key near southern Florida, are likely to be the focus of much more fishing and diving activity since their designations in 1981. The economic, food, and recreational value of saltwater fishing for fun is a significant, growing and renewable component of coastal society in the South Atlantic region of the U.S.

The complete continental shelf, from Norfolk, Virginia to Cape Canaveral, Florida, is used for various military and NASA operations. These operations include training and testing activities such as submarine operations, gunnery practice, sea trials, radar tracking, vessel maneuvers, and general operations. Specific DOD operating areas and the types of activities permitted within each area are delineated in maps published by the Defense Mapping Agency, the Coast Pilot publications, and the CINCLANTFLT Instruction Title 3120.26, Atlantic Fleet Operation Areas. NASA operations from Kennedy Space Center are related to the space program and are periodic.

5. Coastal Habitats and Resources

a. General Description

There are approximately one million acres of coastal wetlands in the Mid- and South Atlantic. Chesapeake Bay, the extensive wetlands landward of the barrier island chain from Long Island south and Delaware Bay, provide spawning and nursery habitat for many species. Numerous coastal embayments in the South Atlantic also provide extensive wetland habitat; 70% of the commercially important fish and shellfish species in the South Atlantic are estimated to use these systems for spawning, nursery, or feeding. The 2,650 miles of nearly continuous estuary/beach systems in the South Atlantic also provide valuable habitat. Wetlands in the South Atlantic provide habitat for the greatest number of migratory waterfowl and breeding shorebirds on the Atlantic coast.

1) Estuaries

Generally, estuaries are semienclosed bodies of water in which freshwater runoff meets and mixes with salt water of the ocean. The result is highly complex physically, chemically, and biologically, and there are many variations on the theme.

Estuaries which occur in this area include the mouths of: St. Lucie Canal; Indian and St. John's Rivers in Florida; Satilla, Altamaha, Canoochee, Savannah, and Cumberland Rivers; St. Catherines Sound; and Ossabaw Sound in Georgia; Broad, Combahee, Edisto, Cooper, and Pee Dee Rivers; Port Royal Sound, St. Helena Sound; and Winyah Bay in South Carolina; and Cape Fear, New, White Oak, Neuse, Champan, and North Landing Rivers and the Pamlico Sound complex in North Carolina.

The image most people see when one says "estuary" is the medium salinity, moderate depth bay which has much fishing but not much visible evidence of anything else. The bay draws support from food webs of invisible microscopic plankton supporting the characteristic populations of crabs, fish, and commercial shrimp. Many of our largest estuaries are predominantly of this type although they are often fringed and bordered by smaller subsystems of other types. High nutrient levels and good stirring mechanisms generally produce high photosynthetic rates wherever clarity of water is maintained, although the rates are less than those found in systems like the marshes which have shallower water depths.

In winter, with low light and well stirred waters due to tidal shifting and some turbidity from rivers, the plant cells spend too much time in the shade and stop making much food. In the spring, as light conditions increase, the critical condition at which the plant cells can make a net gain is reached and there is a sudden bloom of some of the diatoms that sets off the seasonal production sequence. During the winter, there is organic particulate food remaining from the previous season, marshes, rivers, and other storages that allows some of the animal life to persist.

With the rising burst of plankton growth, there are some releases of larvae from clams, oysters, and barnacles, and little water-flea-sized copepods develop. Reproductions and migrations of shrimp and fishes that eat the zooplankton are timed to coincide with the increased yields of

these small components. The estuary has species with some ability in their kidney systems to deal with salinity fluctuation, some ability to switch food intake from organic matter to phytoplankton base, and an effective temporal program for migration and reproduction so as to time the need for more food to the appearance of more food.

Whereas the bottom clams and the special subsystems of the bay margins are contributors, the main system is one of plankton and plankton eaters. As the sunlight begins to decline after July, the population growth and reproduction declines and soon many populations migrate out again, decreasing their load on the system.

Estuaries often have partial stratification with wedges of dense saltwater underneath. In systems allocated to this type, mixing is adequate to prevent anaerobic conditions from developing at the bottom even though oxygen is less there since respiration is higher at the bottom of the estuary than at the surface. Estuaries tend to be deeper as one goes north, but also the amount of tidal energy available for currents and mixing and eddy diffusion coefficients increase.

The markedly different oceanic biotas north and south of Cape Hatteras are not reflected in coastal systems behind the barrier islands. Shape and depth constitute the primary difference between Chesapeake Bay and the North Carolina sounds. Shallow depth and dampened tidal effects promote good mixing. Water masses tend to be relatively turbid and move about in broad, gentle swirls rather than as part of a current. Patterns of water movement depend in large measure on wind direction and velocity. In reality, the sounds are shallow basins into which the estuaries empty. Lower levels of the food web in these sounds have been incompletely studied. In general, production is accomplished by diatoms and dinoflagellates. This energy moves up to the nekton level via copepods. Dominant nekton are of the characteristic "southern" types (e.g., bluefish, striped bass, flounder, mullet, and shad). Bluecrab *(Callinectes)* and menhaden *(Brevoortia)* are abundant and of considerable economic importance (Bellis, 1974).

North Carolina's sounds constitute the largest estuarine system along the Atlantic coast. Most of this vast system is of the medium salinity (5-18 ppt) and plankton-based type, and as such functions as a nursery or a temporary home for migrating nekton of commercial importance. Striped bass and menhaden do most of their "growing" during periods spent in the sounds or near shore coastal waters where they become the beneficiaries of a high level of phytoplankton production. In estuarine systems such as this, efficiency of energy transfer between plant and animal is greater than in most land environments. This is so because the producer components of the food web are primarily diatoms. Diatoms convert some of their carbon intake to energy-rich (high calorie) fats and oils while most green plants store carbon as less rich carbohydrates.

South of Cape Fear, rivers such as the Pee Dee in South Carolina and the Savannah in Georgia empty into the sea via low marshland. Extension barrier islands, the type responsible for formation of the North Carolina sounds, are absent or much reduced in importance. Consequently, estuaries along this portion of the Atlantic coast have been described as a "muddy river mouth" type. Here the "middle-salinity-plankton-based" system consists of tidal channels through the salt marsh, major portions of the Charleston and Georgetown harbors, and a 16-19 km wide strip of "estuarine" water which remains trapped between high salinity ocean water and the beach. Sport fisheries, dependent at least in part on the middle estuary plankton, are similar to those of the North Carolina sounds. Commercial fisheries involve primarily oysters and blue crabs, both of which are directly dependent upon the plankton during one or more stages of their life cycles. Shrimp become of increasing importance southward along the Georgia coast.

Relatively few fish lead an entirely estuarine existence. Killifish (*Fundulus majalis*) appears to be the most abundant truly estuarine species in the Chesapeake region (McHugh, 1967). Other plankton-feeding herring-like fish move into the middle estuary only during a part of the year.

The striped anchovy (*Anchoa hepsetus*) is abundant in Chesapeake Bay in the summer during which time its eggs are a common constituent of the plankton. Anchovies leave the bay during winter, and their position in the food web is occupied by the spotted hake (*Urophycis regius*).

A variety of fish, several of considerable commercial value, use the middle estuary as a spawning ground or nursery. The hogchoker (*Trinectes maculatus*), bay anchovy (*Anchoa mitchilli*), and silver perch (*Bairdiella chrysura*) are important inshore fish which spawn in Chesapeake Bay (McHugh, 1967). Other fish, spot (*Leiostomus xanthurus*), Atlantic croaker (*Micropogon undulatus*), and Atlantic menhaden (*Brevoortia tyrannus*) spawn offshore during colder months. Upon hatching, the young move rapidly into the estuary where they exhibit little growth until the return of warmer weather. Rapid growth occurs in summer as the young fish gradually move down the estuary and into more saline water.

The great majority of numerically or commercially important estuarine fish thus appear to be only summer residents of the middle estuary. Most explanations of fish migration involve correlations with seasonal "climate" patterns such as temperature, day length, breeding behavior, etc. However, the relationship of migration patterns to quantity and quality of food sources may be an equally important aspect of estuarine dynamics.

The degree of variability of the salinity regime is of great importance to species diversity. In highly variable estuaries there is low diversity, and the species are the highly adaptable generalities. As variability decreases, the fauna becomes more diverse and the number of habitat specialists increases. On the basis of the recent studies of macrobenthos distributions, the following general conclusions seem tenable (Darnell, 1979):

(1) low salinity stress restricts the distribution of stenohaline species;
(2) sediment composition and stability is important in determining distribution patterns, especially in lower reaches of estuaries and embayments;
(3) intertidal communities exhibit reduced species diversity, and they are dominated by opportunistic subtidal species;
(4) macrobenthic communities may be predator controlled;
(5) communities may be highly variable seasonally; and
(6) large, deep burrowing species (bivalves, some polychaetes, and callianassid shrimp) are very important in relation to biomass and to sedimentary processes.

Estuarine seagrass beds are important in North Carolina and northern Florida, but they are sparse in the intervening area. Extensive studies are underway in North Carolina where the submerged vegetation covers 17 percent of the subtidal estuarine area and contributes 47 percent - 64 percent of the total annual primary production. Within such beds, inveterbrates are up to 40 times denser than on exposed flats, and they support a characteristic benthic fauna dominated by gastropods, bay scallops, and amphipods. They also provide refuge and feeding grounds for many species of juvenile fishes, crabs, and shrimp, and they annually export large quantities of detritus to other estuarine habitats. Only a few studies have dealt with benthic communities of the salt marshes. Some attention has been given to their relations with dredge spoils and with sedimentary and biogeochemical processes (Darnell, 1979).

2) Wetlands

Salt marshes are typically intertidal beds of rooted vegetation extending from somewhat above the low tide level to supratidal levels inundated only by extreme tides on low energy beaches. They occur along the margins of estuaries, gradually intergrading into freshwater marshes at upstream locations.

Behind the outer banks of the southeastern states, fringing the inner shores of the brackish sounds, irregularly flooded marshes occur. Here tidal amplitudes are very limited and often there are rather great changes in salinity of the ground and flooding water. In these marshes, the tidal amplitudes are usually less than a 0.3 m (1 ft.), and higher tides are wind-driven and associated with storms and rapid changes of wind direction and velocity. In these marshes smooth cordgrass (*Spartina alterniflora*) seldom occurs in extensive stands and is generally found fringing the edge of rather straight tidal creeks.

From Cape Lookout, North Carolina, south to the Jacksonville, Florida area, the optimum development of salt marsh in the United States is found. These marshes, often called low marshes, form behind narrow barrier islands in areas influenced by heavy silt deposition from large rivers. There is a relatively small amount of open water behind the barrier islands. Tidal amplitudes are variable, ranging from 0.6-1.5 m (2-5 ft.) in North Carolina and northern Florida to as much as 2.4 m (8 ft.) in Georgia and South Carolina. Although marshes throughout this entire region are similar, those from Cape Lookout to Myrtle Beach, South Carolina, are somewhat less extensive and well-developed than those from Myrtle Beach to Jacksonville. This latter area includes the famous Sea Islands of South Carolina and Georgia.

The characteristic feature of these marshes is the vast expanse of smooth cordgrass (*Spartina alterniflora*) which covers the soft, grey sediments between mean sea level and approximately mean high water. These broad, nearly level expanses of grass and soft sediment develop under the influence of high tidal amplitudes, dendritic creeks and deep tidal channels in vast number, giving the marshes a characteristic dissection pattern when viewed from the air. The slow, gentle subsidence of these South Atlantic marshes also contributes to formation of these intricate creek patterns.

Several distinct community types may be recognized within the South Atlantic salt marshes (Reed, 1947; Teal, 1962; Adams, 1963). Although these are reasonably well-defined and characterized by a clear combination of physiographic and biotic features, they actually grade into one another so that the marsh is in reality a series of communities which change gradually from the tidal creeks to higher ground.

Freshwater marshes occur primarily near the mouths of larger mainland streams, and they may extend for some distance up rivers before being replaced by cypress-gum or hardwood swamps. Much of the area in the southeastern coastal plain now covered by freshwater marsh was cypress swamp before it was cleared and diked for rice culture. Shallow freshwater marshes contain a variety of species including cattails, several bulrushes, smartweeds, aneilema, arrowhead, arrow arum, and others. The deeper freshwater marshes are more extensive. In many areas this marsh type is comprised almost exclusively of giant cutgrass. Stands of sawgrass occur intermittently. Around the deeper margins of the marsh, stands of cattail are common and wild rice occurs in sporadic stands. In the deeper creeks and potholes, submersed and floating-leaved plants are dominant.

As salinities increase to brackish conditions (about 0.5-2 ppt), giant cutgrass is replaced primarily by big cordgrass and, to a lesser extent, by salt marsh bulrush.

Freshwater marshes basically consist of tidal freshwater and nontidal freshwater. Tidal freshwater marshes are divided into two types based on shallow and deep water depths. The principal type of deep freshwater marsh in the coastal areas is the giant cutgrass marsh, which occurs along the larger streams that are subject to daily tidal effects. These marshes extend inland from the coast up the rivers for several miles in some instances. In general, vegetative species consist primarily of cattails, wildrice, pickerelweed, giant cutgrass, and spatterdocks, often accompanied by pondweeds and other submerged growths in marsh openings. This marsh type is limited to South Carolina and Georgia in the South Atlantic region.

The shallow freshwater marshes are generally located along the larger streams in those portions which are also subject to daily tidal effects. Shallow freshwater marshes are distinguished from the deep fresh water marshes on the basis of their shallow water and vegetative composition (bid cordgrass, maidencane, sedges, rushes, etc.). These marshes occur predominantly in North Carolina in this analysis area.

The mangrove swamp ecosystem occurs sparsely along the United States southeast coast. The northern extremity of these swamps in Florida is along the St. John's River near St. Augustine, and Shaw and Fredine (1971) reported swamps of approximately 10,117 hectares (25,000 acres) in the Cape Canaveral area. The remaining mangrove in this region is restricted to the southern extremity of Florida. Three species of mangrove trees, red mangrove (*Rhizophora mangle*), black mangrove (*Avicennia germinans*), and white mangrove (*Laguncularia racemosa*) dominate the mangrove communities; buttonwood (*Conocarpus erecta*), although not a true mangrove, is important in the transition zone between the swamp and upland vegetation.

Birds are abundant, conspicuous, and probably important in mangrove swamps. Approximately half of the species utilize the swamps for nesting activities and the others feed there or congregate there in large communal roosts. The food resources of the birds are varied. Egrets, herons, ibis, ducks, kingfishers, fish hawks, stilts, and pelicans feed on estuarine fishes and invertebrates; fly-catchers, woodpeckers, wrens, and blackbirds feed on seeds outside the swamps but return for roosting or nesting. The mangroves and their fruits, however, do not directly supply nutriment to birds, and their food supply, like that of the other animals, comes predominantly from marine life in the channels or on the mud flats. The dense nesting colonies in some areas may physically harm the trees, but the excreta is probably of some benefit.

Florida mangrove swamps also serve as nursery grounds for many animal species of economic importance--menhaden, black mullet, spotted sea trout, snook, tarpon, red drum, mangrove snapper, pompano, and pink shrimp. Edible oysters growing on the bottoms of shallow bays or on the mangrove prop roots are also harvested in some areas.

The coastal zone of the Atlantic region lies within the Atlantic Flyway. The largest wintering waterfowl populations are scaup, black duck, mallard, canvasback, and the snow goose. Marsh areas of most bays are important waterfowl habitats. Particularly important are Raritan Bay, Chesapeake Bay and Currituck-Albermarle-Pamlico Sound. Important nearshore areas are the Nantucket Sound-Nantucket Shoals area, off eastern Long Island, off the Virginia Capes, and off the Outer Banks of North Carolina. In addition to waterfowl, coastal areas support waders and shorebirds.

These coastal wetlands and associated bodies of open water are very important to numerous species of waterfowl. Of particular importance are the freshwater marshes, where most developments for the management of ducks are found. Undeveloped cutgrass marshes are used primarily during peak flights in the fall months. While the tidal rivers associated with the freshwater marshes offer little in the way of food organisms, they are nevertheless valuable in attracting waterfowl which utilize the adjacent freshwater ecosystem. The ecosystem is used most by the puddle ducks (mallards, teals, pintail, widgeons, etc.).

Other representative wildlife species include passerine birds, raccoons, rabbits, and small predators. In addition, several freshwater fish as well as some marine fish species utilize the freshwater marsh ecosystem.

In addition, a great variety of immature and mature fish and shellfish are found in the tidal creeks and shallow waters associated with the marsh. Mature oysters (*Crassostrea virginica*), clams

(*Mercenaria mercenaria*), blue crabs, larval and mature shrimp of several species, and the juvenile and mature forms of many fish such as flounder, bluefish, menhaden, croaker, and tarpon are commonly found in the creeks.

Because of the importance of coastal wetlands as nursery grounds for many species important in commercial and sport fisheries; because coastal wetlands are highly diverse and productive ecosystems; because coastal wetlands can play a major role in reducing the impact of ocean derived storms on the adjoining uplands; and because coastal wetlands can be important natural waste treatment plants, utilizing the abundant nutrients which in other areas might be pollutants, any adverse impacts to them which affect these functions could have serious ramifications in many other areas.

During 1977, all of the States within the Mid- and North Atlantic region had areas that were classified non-attainment for one or more air pollutants. The air quality of the South Atlantic States is generally good, but, major urban centers and their environs experience high pollution concentrations. Photochemical oxidants (ozone), suspended particulates, and carbon monoxide were the pollutants most often cocurring in violation of standard levels. (40 CFR Part 81.3).

b. Habitats and Resources of Special Concern

Based on an inventory of known and existing coastal archaeological sites and the suspected sea level transgressions, Paleo-Indians could have potentially inhabited what is now the continental shelf as long as 18,000-20,000 years ago. Direct evidence of specific inundated prehistoric sites has not been documented on the South Atlantic Shelf to date with the exception of a few shallow water, nearshore sites bordering the existing shoreline. This lack of documented sites is due mainly to lack of investigations on the South Atlantic; however, numerous prehistoric sites have been documented by investigators on the Pacific OCS.

Documented evidence of 1,820 potentially significant historic shipwrecks are known off the South Atlantic between 1500 and 1945. Of these wrecks, 1,467 are pre-20th centruy. Only 46 of these pre-20th century wrecks have specific locations given by latitude and longitude.

The *USS Monitor* off Cape Hatteras is the only known shipwreck on the South Atlantic OCS currently on the National Register of Historic Places.

Evidence of prehistoric occupation of the coastal area of the South Atlantic region from the earliest Paleo-Indian period through the Archaic and into the Woodlands periods (which lasted until contact with the first European settlers) is found throughout the area from the tidal zone landward. Rudimentary sites from early cultures and larger haibtation sites and burial complexes from the later periods are also located in considerable numbers.

The coastal areas of the South Atlantic states have been prominent in American history from earliest colonial times. The reigon contains many buildings, structures, and sites that are important to the preservation of American history, architecture, and culture. The majority of these are located inland from the surf/tidal zone and would be unaffected by any OCS-related activity. Coastal fortifications and lighthouses typify historical sites found within the surf/tidal zone a nd are often protected by various means such as bulwarks or other barriers.

The major portion of the Atlantic coastline is used for recreational purposes. Coastal-related activities include beach use, swimming, boating, picknicking, fishing, hunting of waterfowl, and nature interpretation. Coastal wetlands that exist along estuaries and embayments are critical and vulnerable environments that provide nutrients and habitats for a wide variety of coastal and marine organisms. Migratory and breeding habitat for waterfowl and shorebirds is in the north. The greatest concentration of waterfowl occurs in the Chesapeake Bay area—the nation's largest estuary.

The diverse environments found in coastal areas where water and land converge are a magnet for leisure pursuits. The coastal beaches, barrier islandds, estuarine bays, and sounds and tidal marshes found from Cape Hatteras to Cape Canaveral are increasingly utilized for recreational activity by residents from the South Atlantic states and tourists throughout the nation, as well as many foreign visitors. A significant element of the economy of the coastal plains region is tied to the quantity, quality, and diversity of natural and developed recreational resources associated with the South Atlantic coastal zone.

6. Socioeconomic Factors

a. General Description

The South Atlantic coastal region from Norfolk, Virginia to Miami, Florida has experienced relatively little industrial development in the past. Instead, the major development activity has centered around area ports and tourism. Although economic growth was slow during the 1960's, particularly in the upper half of the South Atlantic region, this general trend has seemingly reversed throughout the 1970's as population movements from the northeastern United States have resulted in a 22 percent population increase over the 1970-80 period for all Standard Metropolitan Statistical Areas (SMSA's) in the region. The region's major urban and economic centers are located around the natural harbors of Norfolk (Virginia), Wilmington (North Carolina), Charleston (South Carolina), Savannah (Georgia), and Jacksonville, Port Everglades, and Miami (Florida), with less activity occurring at the ports of Morehead City (North Carolina), Georgetown (South Carolina), Brunswick (Georgia), and Port Canaveral and Palm Beach (Florida).

b. Factors of Particular Concern

There is negligible production of petroleum and petrochemical products in the South Atlantic coastal area. At the present time there are five new refineries proposed for the South Atlantic seaboard, which would be located at Portsmouth (Virginia), Morehead City and Belville (North Carolina), Georgetown, and Savannah. Most of these refineries are expected to be small. It should be noted that there have been many refineries previously proposed for the East Coast which have been cancelled for such reasons as environmental opposition, high crude oil costs, high construction costs, and unreliable sources of crude oil. A 1979 study by the Princeton University Center for Environmental Studies lists 23 Atlantic coast sites where proposed refinery projects have been dropped due to local and environmental opposition in the last 20 years (Gordon et al., 1981). Thus, the future of the current proposals may be considered quite uncertain.

As previously discussed, there are 12 major commercial ports within the South Atlantic region. The larger of these ports are served by channels with an 11.6-12 meter (38-40 feet) water depth; the smaller channels have a water depth of 10.6 meters (35 feet) or less. All of these ports are served by either the Atlantic Intracoastal Waterway or Florida Intracoastal Waterway which have a water depth of 3.7 meters (12 feet).

The Atlantic Ocean, its beaches, associated historical features, national seashores, and resorts are tourist destination areas contributing significantly to the economy of the coastal region. Major natural and developed attractions such as Virginia Beach, the Outer Banks of North Carolina, the Grand Strand area of South Carolina, Jekyll Island in Georgia, and Daytona and Miami Beaches in Florida are nationally recognized recreation, vacation, convention, and business meeting areas accomodating millions of visitors annually. The economic viability of many small coastal communities as well has become dependent on the expenditures of visitors traveling to and through their areas. Although efforts are made to maintain a steady flow of visitors all year long, the spring and summer are the peak use seasons associated with beach and ocean attractions.

Travel expenditures in the coastal counties of North Carolina with ocean shorefront amounted to almost $150 million directly supporting 12,430 industry related employees from over 2,000 active firms in 1978 (Skelton, Angela. N.C. Dept. of Administration, 1980). New Hanover County which encompasses the historic city of Wilmington and shorefront destination sites such as Wrightsville, Carolina, Wilmington, and Kure Beaches accounts for over 40 percent ($60 million) of all coastal travel expenditures and tourism related employment. Dare County, which includes many of the Outer Banks and Cape Hatteras National Seashore (1978 visitation-1,800,000), accounted for 19 percent ($27.5 million) of all travel expenditures in coastal North Carolina.

In South Carolina during 1978, the state's four main beach resort destinations had a total visitation of over 10 million persons who spent more than a billion dollars. This represents approximately 78 percent of the state's entire nonresident tourism expenditures for that year. These four major destination areas were Grand Strand (Myrtle Beach), Charleston, Beaufort, and Hilton Head Island.

The Georgia coast is known for its sea islands, many of which are managed for natural values, where transportation to the seashore does not encourage concentrated shorefront public use. Chatham County, which includes Tybee Beach and Glynn County encompassing Jekyll, St. Simons and Sea Islands are exceptions and cater to a large tourist population interest in seashore enjoyment. The Georgia Department of Industry and Trade, in consultation with the University of Georgia's Office of Leisure Studies and Tourism, developed a methodology to estimate the economic value of tourism at Georgia's most popular beach communities. In 1977, tourism-related sales in Chatham and Glynn counties were over $196 million and accounted for over 20 percent of total retail sales in these counties. Tourism-related personal income exceeded $54 million.

Tourism is Florida's number one industry with visitation exceeding 32 million people in 1980. Approximately 580,000 Floridians were involved in tourist-related employment and tourist expenditures were over $17 billion statewide. Thus, on average tourists spent about $47 million a day in Florida in 1980. Furthermore, the 1980 Florida Visitor Study indicates that about two-thirds of Florida visitors consider the beaches an important asset. Dade (Miami), Broward (Fort Lauderdale), Palm Beach, and Duval (Jacksonville) counties were the first, second, fourth, and eighth most popular destinations with air travelers, while Volusia (Daytona Beach), Duval, and Dade counties ranked second, ninth and tenth among auto visitors. Although these counties account for the most numerous visitation along the Florida Atlantic Coast, the entire Atlantic shorefront is stongly influenced by beach-related tourism.

B. Gulf of Mexico

This region contains three planning areas, the Eastern, Central and Western Gulf of Mexico.

1. Geology

For the purpose of this discussion the Gulf of Mexico Region has been subdivided into the Eastern, Central and Western Gulf planning areas.

a. Eastern Gulf

The continental shelf margin of the eastern Gulf is dominated by the Florida Platform, consisting of massive sequence of carbonate and evaporite deposits of Mesozoic and Cenozoic age. The major structural features of the region are the Ocala Uplift, the Peninsular Arch, and the South Florida Basin.

The results of drilling to date in the eastern Gulf are discouraging. Major potential exploration targets in the area are stratigraphic pinchouts, shelf margin reef facies, and structural traps associated with salt tectonics, growth faults, and anticlines.

b. Central and Western Gulf

The northwestern Gulf shelf and slope overlie the Gulf Coast Geosyncline. This geosyncline is an extremely thick terrigenous clastic (interbedded sand, silt, and clay) sequence that extends from northeastern Mexico to southeastern Louisiana. The locus of maximum deposition has migrated northeastward from south Texas beginning in the Eocene to southeast Louisiana at the present. As a result of the overall pattern of marine regression, the axis of this thick clastic sequence has shifted steadily Gulfward. Consequently, the resulting deposits form a pattern in which successively younger rock units occur progressively farther seaward than the underlying older units.

Five major structural elements referred to as the Rio Grande Embayment, the San Marcos Arch, the East Texas or Houston Embayment, the Sabine Arch, and the Mississippi Embayment are aligned transverse to the axis of the Gulf Coast Geosyncline.

Hydrocarbon potential on the federal OCS has been established in sediments ranging from Miocene to Pleistocene, in structural traps such as anticlines, growth faults, and salt and shale diapir associated traps, as well as in a myriad of other stratigraphic traps.

There were approximately 482 fields on the federal OCS of the Gulf as of December 1980. This figure includes 16 depleted fields (abandoned after significant production). USGS records show that 267 million barrels of oil and 4.6 trillion cubic feet of gas are produced annually from the Gulf.

Unstable bottom sediments and shallow gas deposits are primary geologic hazards in the Gulf of Mexico. Hazards of a more local nature include mudflows and slumps near the Mississippi Delta karst topography on the west Florida platform, and faulting associated with mobile diapirs and the compaction of sediments.

2. Physical Oceanography and Meteorology

In general, the circulation in the Gulf of Mexico is complex, with only large-scale trends being identified and somewhat understood in most cases. This complex circulation can be classified by two interrelated systems: the large-scale circulation associated with the open Gulf and the more localized circulation associated with the inshore (shelf area).

The large-scale circulation is influenced by five major factors: The Loop Current, winds, waves, freshwater input, and in general, the resulting temperature/density structure of the water column. The inshore (localized) circulation on the shelf is influenced mainly by tides and local winds which create such phenomena as longshore currents, shallow wind-driven currents, and the variability associated with tidal flow. The shelf area acts as the interface to these two systems which also happens to be the more active area for oil and gas exploration, development, and production.

The Loop Current is by far a major influence to the Gulf. It enters the Gulf as the Yucatan Current, penetrates north into the Eastern Gulf, turns clockwise and exits the Gulf through the Straits of Florida. The Loop Current undergoes periods of growth and decay which have been thought to exist on an annual cycle. The following figure shows a compilation of pathlines of the 22°C isotherm at depth from August 1972 - September 1973.

As illustrated, the variability of the position of the Loop Current is large. A frequency analysis of the location of the Loop Current shows the 25 percent line to reach as far north as 29° N latitude during parts of the year with it sometimes following a near direct path between the Yucatan Straits and the Straits of Florida.

The Loop Current seems to constantly be in a dynamic state. On a timescale of weeks and months, the Loop Current is constantly in a state of growth or decay. One very noticeable change in the Loop Current takes place as it extends far into the northern part of the eastern Gulf. As the current reaches the northern latitude of the Gulf, it appears to break away from itself and from a rather large anticyclonic eddy. This eddy usually becomes a feature that is separate and distinct from the broken Loop Current. As the eddy forms from the northern section of the Loop, the southern section joins together again as the Loop Current and resumes its structure south of the eddy and in the area of 25° N latitude. This cyclic growth and decay is depicted by a plot of the northernmost position of the Loop vs. time in the following figure.

Although the Loop Current is a distinct water mass with relatively strict boundaries, there is known to be some intrusion on to the shelf, thus resulting in an influence to the circulation in these areas. Also, the eddies that are shed by the Loop Current often drastically influence the circulation in the northeast corner of the Gulf. As these eddies age, they generally have movement in a westerly direction, thus influencing the areas through which they travel until they finally decay 4-10 months later in the central or northwestern Gulf.

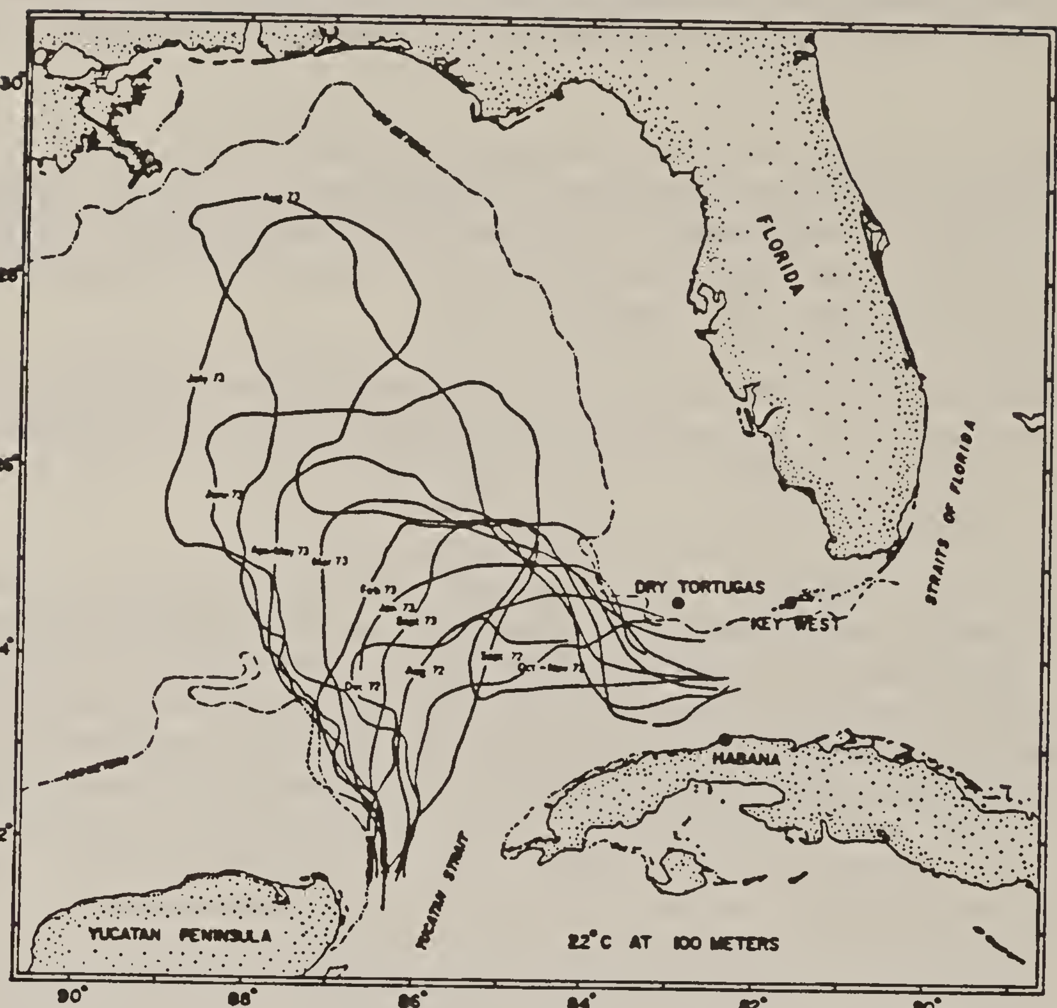
Another major feature in the Gulf is the presence of a semipermanent Gyre in the mid-western Gulf. Just like the Loop Current, this Gyre is thought to be constantly in a state of spin up or spin down, thus, providing a very dynamic feature. This Gyre is thought to be due partly to wind stress and the introduction of anticyclonic eddies from the Loop Current.

The major features mentioned here – the Loop Current in the east and the Gyre in the west – result in fairly high velocity water movement on the order of 1-1.5 kts with great variability in location and influence to local conditions.

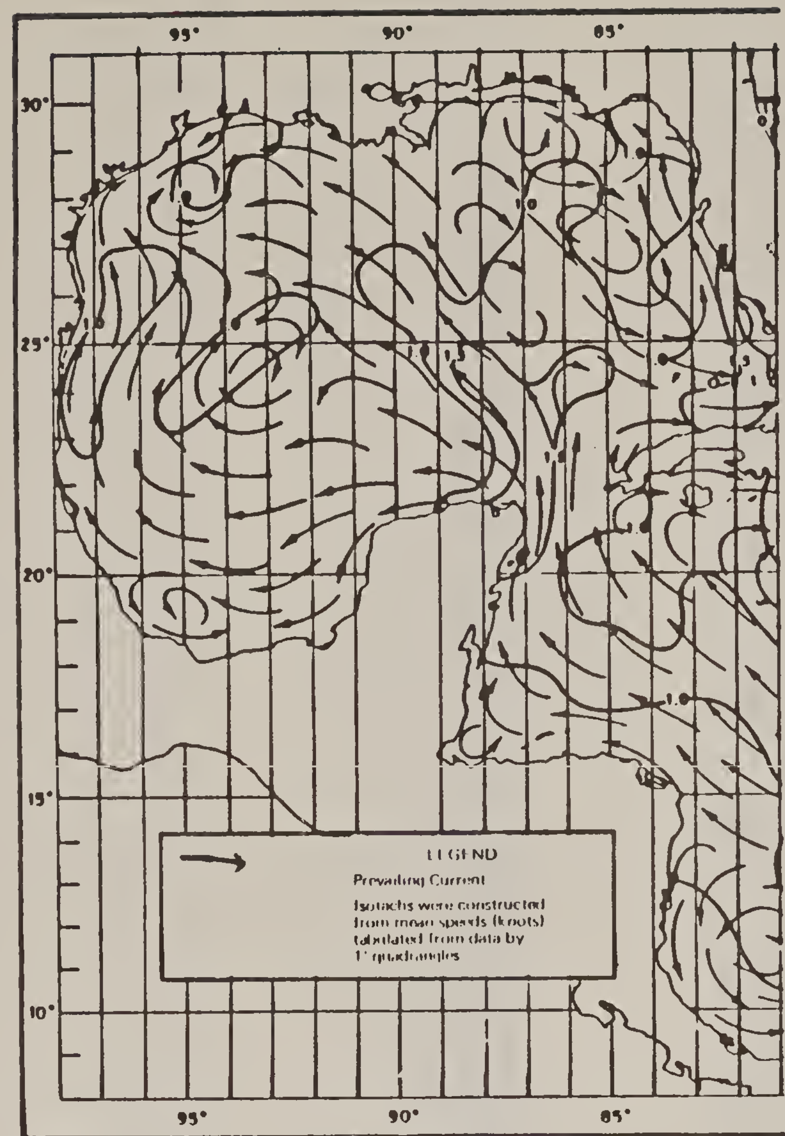
The following figure shows the prevailing surface current patterns in the Gulf for the summer and winter seasons.

Although the following figure shows the prevailing surface current patterns for open Gulf areas, the inshore circulation as previously mentioned is mainly a function of wind and tide.

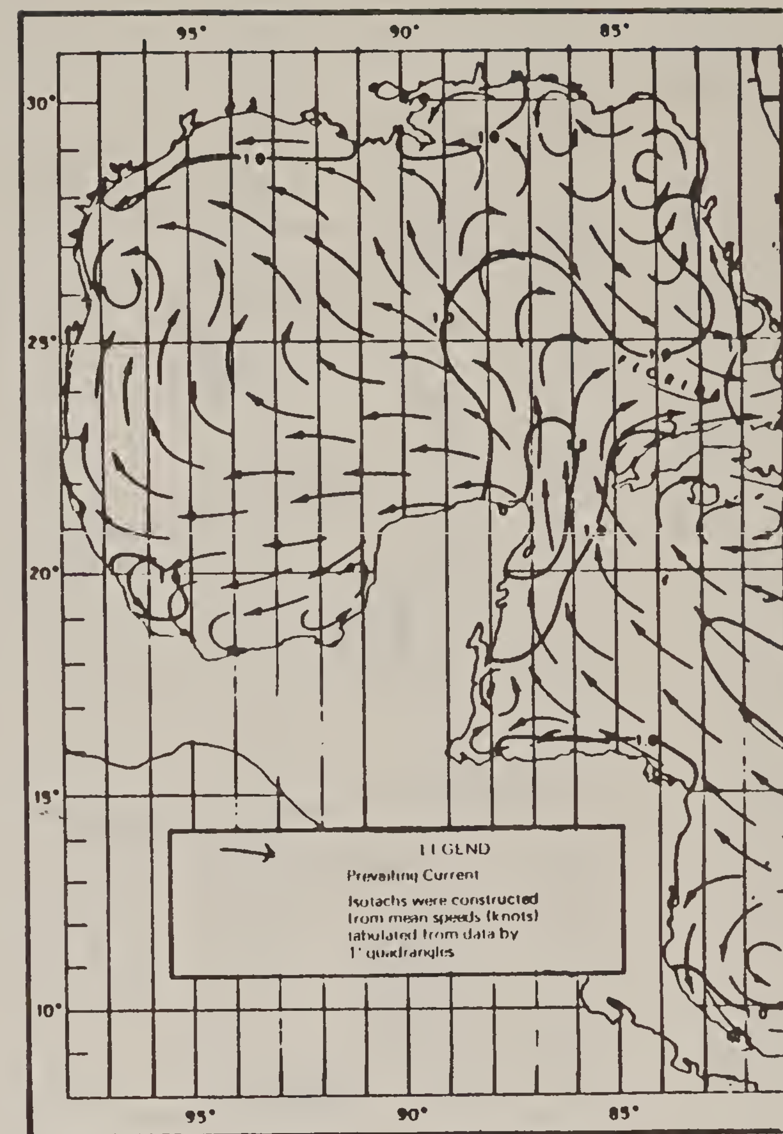
Maul: Annual cycle of Gulf Loop Current (1977).



Compilation of pathlines of 22°C isotherm at 100-m depth from August 1972 through September 1973 (see the following figure). Where the indicator isotherm intersected the bottom topography, a dashed line is used to estimate its position from the other thermal data. Where the cruise started in 1 month and ended in another, both months are indicated. 100 m isobath is indicated by a dash-dot line and represents very closely the shelf break and escarpment zone.



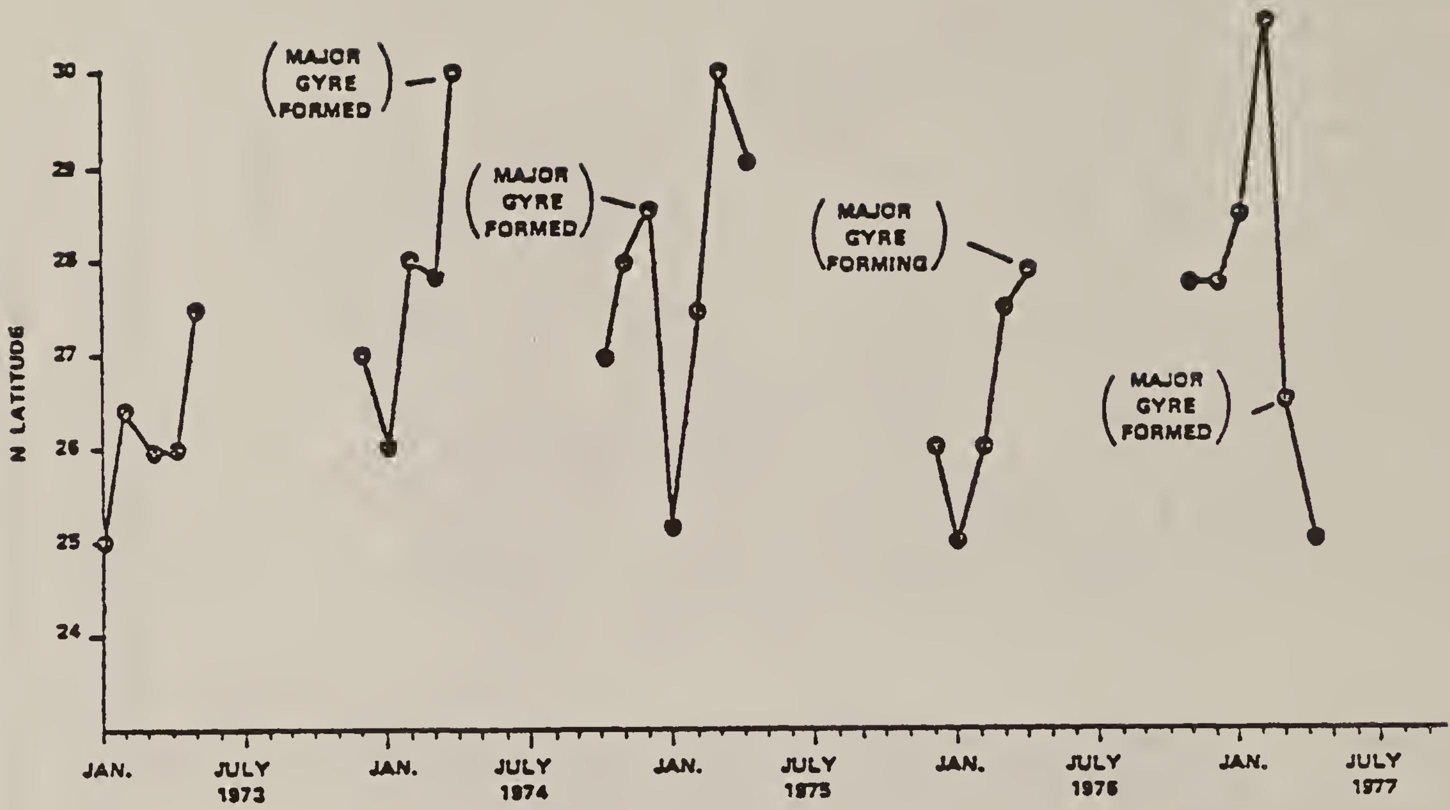
SUMMER



WINTER

PREVAILING SURFACE CURRENT PATTERNS

From SP - 189 II - U.S. Naval Oceanographic Office, August 1972.



Plot of the northernmost position of the Loop Current versus time based on available NOAA satellite data for the period October through May 1973-1977 (from Vukovich et al. (1978)).

Some offshore wind characteristics are shown on the following table.

The tides of the Gulf of Mexico are weakly developed and usually their observed range does not exceed 0.7 m. Semidiurnal (twice daily) tides are small; therefore, overall tides in the Gulf are considered diurnal (daily) in character. Spring tides are slightly higher, but since the range is small, meteorological effects can completely mask tidal fluctuation at times. Highest mean water level occurs during the period of December-March. Tidal currents do have some effect on flushing rates in bays and sounds with the maximum tidal current velocity often in excess of two knots in and around entrances to these areas.

The most noticeable effects that tidal fluctuations produce occur in combination with the localized wind driven surface currents, the freshwater input, and the longshore currents to produce somewhat irregular and unpredictable inshore circulation and mixing.

The Gulf of Mexico coastline is characterized as a low energy area in terms of wave power. The annual average wave heights are 0.9 m with 75 percent of all waves being smaller in height than 1.5 m.

Easternly waves and tropical storms appear in the Gulf during late summer and early fall. The principal paths of tropical storms into the Gulf are through the Yucatan Channel and Straits of Florida. Over half of these tropical storms become hurricanes during this season.

The largest and most destructive storms affecting the Gulf of Mexico and adjacent coastal zones are tropical cyclones. These have their origin over the warm tropical waters of the central Atlantic Ocean, Caribbean Sea or southeastern Gulf of Mexico. They occur most frequently between June and late October and there is a relatively high probability that tropical cyclones will cause damage in the Gulf of Mexico each year.

Warm, moist Gulf air blowing slowly over chilled land or water surfaces brings about the formation of the fog. The period from November through April has the highest frequencies of low visibilities. Generally, coastal fogs last three or four hours although particularly dense sea fogs may persist for several days.

3. Marine Habitats and Resources

a. General Description

The benthic habitats can be divided by faunal assemblages into the white shrimp grounds or inner shelf, the brown shrimp grounds or midshelf, the shelf break, and deeper, the slope. The inner shelf area is dominated by estuarine associated fauna. The midshelf area is composed of a fauna which is largely estuarine independent, and for demersal fishes, supports a greater biomass and richer fauna than the inner shelf area. The central and western Gulf have a nepheloid layer near the bottom throughout much of the area. Because of this, macroalgae are not abundant.

West of the Mississippi River, the shelf corresponds to the brown shrimp grounds of Chittenden and McEachran (1976). This area is characterized by nonestuarine-associated ichthyofauna and is dominated by the longspined porgy (*Stenotomus caprinus*). The shelf is reported to support a higher biomass than the nearshore white shrimp grounds.

In the eastern Gulf, the De Soto Canyon has unique areas of high relief and reefal assemblages. Recently three portions of the canyon were surveyed–the northern rim, 54-60 m in depth (Shipp and Hopkins, 1978); the western flank (68-375 m); and the eastern flank (72-115 m). Shipp and Hopkins (1978) observed limestone ledges bordered by sandy flats. Relief of the ridges increased to 10 m to the southwest. They reported that the ledges become discontinuous and many "spire-like" ledges of 10-15 m relief were evident on fathometer records. Tall pinnacles and irregularities occur on the eastern flank between 86-90 m. One pinnacle encountered rose 11 m above the seafloor. These outcrops were encrusted by sponges, sea fans, and sea whips; congregations of tropical reef fishes were also reported.

Farther to the southwest and in somewhat deeper water, a BLM-funded study, Final Report Contract AA551-CT8-22 (Woodward-Clyde Consultants, 1979), observed irregular reef-like features and pinnacles up to 9 m in relief; these occurred around 80-115 m. Coral (*Oculina*), sea whips, sponges, and reef fish concentrations were observed on both the northern rim and the western flank.

Pelagic nekton such as cephalopod molluscs, billfish, tunas, sharks, an mackerels range over the shelf.

GULF OF MEXICO OFFSHORE WIND CHARACTERISTICS

Area	Direction (from)	Annual Mean Speed (Kts)	Pct-Freq-Annual
Offshore Key West	N	10.5	8.9
	NE	11.8	18.0
	E	12.3	35.8
	SE	10.7	16.5
	S	9.5	7.0
	SW	9.3	3.2
	W	9.9	2.9
	NW	10.7	4.2
	Calm	0.0	3.5
Offshore New Orleans	N	12.6	11.4
	NE	12.4	14.3
	E	11.9	20.3
	SE	11.8	20.3
	S	11.5	13.5
	SW	10.5	5.2
	W	11.6	4.9
	NW	13.1	6.7
	Calm	0.0	3.3
Offshore Corpus Christi	N	14.8	11.6
	NE	12.4	12.1
	E	11.2	17.2
	SE	12.7	30.2

S	12.8	17.7
SW	10.1	3.4
W	10.1	2.0
NW	13.0	4.0
Calm	0.0	1.8

b. Habitats and Resources of Particular Concern

In the region of the shelf break, the central Gulf is characterized by a series of "topographic highs" which are geologic features rising out of 100-200 m to various depths and trending east-west along the break. Many of these are the surface expression of salt domes, and nearly all are hard, rocky outcrops; many are drowned coral reefs. The hard, more or less vertical surfaces provide habitat and food for a wide variety of organisms. It has been found, largely through BLM-funded studies, that at similar depths all of these banks contain similar biological communities. The East and West Flower Garden Banks off Texas and Louisiana rise closer to the water's surface than the others and are the only two which contain living coastal reefs. The following description of the Flower Garden Banks from Bright and Rezak (1976) indicates the importance of these topographic features as habitats for diverse biota:

Over 250 species of benthic invertebrates and more than 100 fishes inhabit the East Flower Garden Bank. Above 25-29 m the bank is covered with a thriving submerged coral reef which, except for its total lack of shallow-water alcyonarians, is a good example of the *Diploria-Montastrea-Porites* community so common on reefs in the Caribbean and Southern Gulf.

In addition, the bank harbours sizeable knolls occupied almost entirely by populations of the small branching coral *Madracis mirabilis (Madracis* Zone). Finger-sized remains of dead *Madracis* are extremely important components of the sediment on and adjacent to the reef. In some cases the coarse carbonate sand which typically occurs between coral heads in the *Diploria-Montastrea-Porites* Zone is entirely supplanted by *Madracis* rubble.

Other knolls at the bank are covered completely by lush growths of leafy algae (*Caulerpa, Chrysymenia, Halymenia, Lobophora, Microdictyon,* and others). The presence at the East Flower Garden of this Leafy Algae Zone, the *Madracis* Zone, and knolls of intermediate biotic composition (which bear various types of sponges, *Madracis* clumps, patches of leafy algae, and extensive encrustations of coralline algae) is indicative of a greater degree of lateral biotic variability on the 69 ac crest of this bank than has been observed at the West Flower Garden Bank.

Between 50 and 76 m, the bank is occupied by an Algal-Sponge Zone. The bottom in the Algal-Sponge Zone is covered primarily with nodules (up to fist size and larger) composed of encrustations of coralline algae, mostly *Lithophyllum* and *Lithothamnium*, with lesser amounts of the encrusting foraminifer *Gypsina plana*. The coralline algae are important and abundant in the *Diploria-Montastrea-Porites* Zone, as well as in the Algal-Sponge Zone, extending to depths exceeding 90 m but decreasing in percent cover below 75 m or so.

In the the lower reaches of the Algal-Sponge Zone the nodules give way to coralline algal crusts adhering to the hard carbonate substratum. Among and attached to the nodules of the Algal-Sponge Zone is a sizeable population of leafy algae, generally the same organisms which occur in the Leafy Algae Zone at the bank. Sponges are very conspicuous, particularly the encrusting *Neofibularia nolitangere oxeata*, the tube sponge *Callyspongia vaginalis* and a branching sponge, *Verongia* sp. Other notable conspicuous invertebrates of this zone are small saucer shaped growths of agariciid stony corals and large anemone, *Condylactis* sp.

Certain expatriate reef fishes are moderately abundant within the Algal-Sponge Zone (viz: squirrelfishes, *Holocentrus* spp.; groupers, *Mycteroperca* spp.; Creolefish, *Paranthias furcifer*; Wrasse bass, *Liopropoma eukrines*; Red snapper, *Lutjanus campechanus*; Vermilion snapper, *Rhomoboplites aurorubens*; Reef butterflyfish, *Chaetondon sedentarius*; Blue angelfish, *Holacanthus bermudensis*; Cherubfish, *Centropyge argi*; Yellowtail reeffish, *Chromis enchrysurus*; and Spotfin hogfish, *Bodianus pulchellus*).

The deepest hard-bank assemblage represented at the East Flower Garden Bank is the Antipatharian Zone. The Antipatharian Zone represents a transition downward from the shallow-water benthic biota to a truly deep-water assemblage. Missing from the Antipatharian Zone proper are any stony corals except sparse populations of the saucer shaped agariciid, a small species of *Madracis* and some solitary ahermantypic varieties. *Lithophyllum* occurs in reduced quantities, and leafy algae are sparse. Present are abundant populations of comatulid crinoids, and deep-water alcyonarian fans and whips, all of which are either absent from or rare above 76 m at the Flower Gardens. The most conspicuous organism in this zone is a bedspring-shaped, white anti-parharian sea whip, *Cirripathes*. Although the depth range of the antipatharians extends upward almost to the coral reef they are rarely seen shallower than 55 m.

Natural gas seeps have been observed at most of the major reef and banks off Texas. These seeps are intermittent in nature and characteristically emit repeated short bursts of several to hundreds of bubbles, each generally less than one inch in diameter.

The chemical compositions of gases collected from various seeps suggest that some are of biogenic origin (microbial decomposition of organic matter in anoxic environments at temperatures below 50°C) and some are petrogenic (thermocatylitic processes acting on organic matter at higher temperatures). It is apparent that the gas seeps associated with shallow coral reefs at the East and West Flower Gardens are biogenic in nature, although deeper seeps at the East Flower Garden may be partly or wholly petrogenic. Whatever their origin, the gases from these seeps have been found to consist of 98.5-99.99 percent methane with traces of ethane and propane.

There is no evidence that such seeps have had any large scale effects on benthic populations. A possible instance of very localized effects of biogenic gas seeps on coral "health" was recently detected at the West Flower Garden at a depth of 25 m. A *Montastrea annularis* head around which gas was intermittently bubbling ranged in color from brown to mustard yellow and was plagued with ulcer-like dead patches covered with or ringed by growths of filamentous algae. However, insofar as such conditions are common at the Flower Garden Banks there may be little or no connection between the gas seep and the poor condition of the coral. Speculation that fishes are attracted to gas seeps has not been confirmed by our observations. The fish are nearly always inclined to position themselves over or beside coral heads, rocks, outcrops, or bottom irregularities. Where they occur, the gas seeps are frequently associated with these features. However, fishes congregating nearby seem to be oblivious of the gas, showing no behavior which would indicate an affinity for it.

A quarter hectare or so brine pool was discovered in 1976 in a depression on the East Flower Garden Bank at 72 m. Apparently seeping from a diapiric structure underlying the bank (salt domes are common off Texas and Louisiana, accounting for many of the topographical features found there), the 188 parts per thousand (ppt) brine flows over the margin of the pool down the axis of a canyon cut into the bank's hard carbonate stustratum and out onto surrounding level, sandy bottom at 80 m. By the time the brine has traveled this far it has become diluted to

39.6 ppt due to turbulent flow and mixing in the axis of the canyon. This is evidence that the sustained flow of dense water through the 7-15 m deep canyon contributes locally to sediment transport and erosional processes resulting in movement of sand-to-cobble-sized particles off the hard-bank and possibly disintegration and dissolution of the old reef, which seemingly at this depth is a coralline algal bioherm.

Filamentous and leafy algae are associated with the East Flower Garden brine. A significant bacterial population on the bottom of the brine pool is indicated by large vivid patches of purple on the sediment surface.

In spite of its rather potent nature, the brine does not appear to have affected epibenthic populations outside of a ring extending a meter or so above the interface between the brine and overlying average marine water. Fishes were not observed to enter the highly saline brine in the pool but groupers, *Mycteroperca* spp., and Cottonwick, *Haemulon melanurum*, swam freely in and out of the mixing brine stream within the canyon.

The West Flower Garden Bank is quite similar to the East Flower Garden Bank, although it apparently lacks some of the shallow biotic zones found at the East Flower Garden above 45 m, namely, the Leafy Algae Zone and *Madracis* Zone (Bright and Pequegnat, 1974).

Water clarity on the bank is exceptional with visibility consistently exceeding 15 m and often 30 m. The main living coral reef (*Diploria-Porites* Zone) occupies the crest of the bank down to approximately 46 m depth.

Living corals cover 30 to 50 percent of the bottom where the reef is developed, and the major reef builders are *Montastrea, Diploria,* and *Porites*, probably in that order of importance. The fire coral, *Millepora alcicornis*, encrusts reefrock throughout the zone as do various species of sponges and other epifauna.

At the time of this writing, the Office of Coastal Zone Management (OCZM), a part of the National Oceanic and Atmospheric Administration (NOAA) of the Department of Commerce, has under consideration a proposal to designate the East and West Flower Garden Banks as a marine sanctuary. The DEIS on the proposal was made available on April 12, 1979, and the proposed regulations that would apply if designation were to occur were published in the *Federal Register* (44 FR 22081-22088) on April 13, 1979. No FEIS on this proposal has yet been prepared, and it is not known at this time if NOAA intends to pursue the proposal.

In the western Gulf (from south of Freeport where the break turns to the south) such deep and clearwater features are not found; rather, a series of low relief banks rising only on the order of 10-20 m in 60-80 m water depth are located further up the shelf. Compared to the banks of the central Gulf, these banks have depauperate flora and fauna (Bright and Rezak, 1978a). More sediments are found on the banks, and the water is generally more turbid than that found at the central Gulf banks. These banks, while important biologically, are not nearly so rich and diverse as those of the central Gulf.

The stipulations described in Section IV.B.3.c. will provide protection for the biota of these topographic features from the potential impact of nearby oil and gas operations.

Unfortunately, much less is known about the seafloor features of the eastern Gulf, but it is known that the Florida shelf has extensive "hard bottom" areas which may be "live bottom" areas if water conditions and depth permit the growth of rich biological communities. Live bottoms are defined as those areas which contain biological assemblages consisting of such sessile invertebrates as sea fans, sea whips, hydroids, anemones, ascidians, sponges, bryozoans, or corals living upon and attached to naturally occurring hard or rocky formations with rough, broken, or smooth topography or whose lithotope favors the accumulation of turtles and fishes. The available evidence indicates that these areas are sparsely scattered in small patches throughout the shelf of the eastern Gulf (Bright and Jaap, 1976). The Florida Middle Grounds are probably the best known and most biologically developed of these areas with extensive inhabitation by hermatypic corals and related communities. In general, since species diversity and biomass decreases with increasing depth, it is believed that unique and productive live bottom areas requiring protection from potential adverse impacts from oil and gas operations will not be found at depths greater than 100 m. It should be noted that a study in progress on the west Florida shelf (contract no. AA851-CT0-50, Southwest Florida Shelf Ecosystems Study) may develop information which will require modification of either the stipulation or its application; such modification, if necessary, will be carried out with the advice and consultation of FWS, USGS, and the state of Florida. The stipulation being considered at present is described in Section IV.B.3.c.

4. Other Uses of the OCS

a. General Description

A heavily used shipping pattern has developed across the open waters of the Gulf of Mexico. This shipping pattern utilizes a series of established fairways leading into the 21 major ports of the Gulf coast. For a discussion of these Gulf coast ports see section IV.B.6. A deepwater oil terminal (LOOP) offshore Louisiana began the transshipment of oil in 1980, a deepwater oil port has been approved for offshore Galveston, Texas, and a liquid natural gas terminal has been proposed for offshore Corpus Christi. All three deepwater terminals have fairways established that tie into the existing Gulf fairway pattern.

There are two approved EPA ocean dumping sites in the Western Gulf and one EPA approved site in the Central Gulf. However, none of these are presently active.

The air space over the Gulf of Mexico is used extensively [illegible] the Department of Defense for conducting aircraft and pilot training, mission development and control, gunnery practice, sonar buoy emplacement, missile testing, and various air-to-air and air-to-sea research activities. A series of nine military warning areas have been established in the Gulf within which the defense agencies conduct operations. The Western Gulf has two warning areas, the Central Gulf has two warning areas, and the Eastern Gulf has five warning areas and five water test areas.

b. Uses of Particular Concern

Commercial fishing is an important economic use of the OCS of the Gulf of Mexico. This area is the single most important area for fisheries production in the United States. In 1980 the total landings of all fisheries in the Gulf were about two billion pounds worth about $463 million (USDC, 1981). These figures represent about 31 percent of the total United States landings by pounds and 21 percent by value.

Total fish and shellfish landings in the eastern Gulf (Florida's west coast) in 1977 were 116.7 million pounds valued at $76.5 million (USDC, 1980A). Important shellfish and finfish landed here include shrimp, spiny lobster, oysters, stone crab, blue crab, snappers, groupers, mackerels, spotted seatrout, and black mullet.

Landing statistics for the central Gulf (Alabama, Mississippi, and Louisiana) follow: Alabama landings statistics for 1977 indicate that the dockside value of all commercial species was about $37 million. Shrimp was the most important commercial fishery with a dockside value of $33.5 million (Alabama Coastal Area Board, 1980). Commercial landings of fish and shellfish at Mississippi ports in 1977 were 246.8 million pounds valued at $23.4 million. Menhaden landings were 229.0 million pounds valued at $10.3 million; shrimp landings were 10.5 million pounds valued at $10.1 million (USDC, 1978). Louisiana ranked first in the United States in both commercial fisheries landings and value in 1979 with 1.5 billion pounds landed worth $198.5 million (USDC, 1980B) and in 1980 with 1.4 billion pounds landed worth $178.0 million (USDC, 1981). The principal fisheries in Louisiana are the shrimp and menhaden fisheries. In the central Gulf substantial amounts of oyster and finfish are also landed.

Total landings in the western Gulf (Texas ports) in 1978 were 98.7 million pounds worth $147.9 million (Liebow, et al., 1980). The principal species landed include shrimp, blue crab, and oyster. Substantial harvesting of finfish also occurs here.

5. Coastal Habitats and Resources

a. General Description

The Gulf coast wetlands are of special concern from both an environmental and economic standpoint because they are vital not only as breeding grounds, flood plain protection, erosion control, and wildlife habitat, but also for aesthetic and recreational purposes. Numerous federal and state conservation/wildlife management areas and preserves have already been established that serve to protect large areas of the Gulf coastal zone from intense development pressures. In Florida, a statewide system of aquatic preserves has been established to set aside certain exceptionally valuable areas for perpetual public enjoyment and to preserve important natural ecological systems.

1) Coastal Habitats of the Eastern Gulf of Mexico

a) Mangroves

Three species of mangrove trees, red mangrove (*Rhizophora mangle*), black mangrove (*Avicennia germinans*), and white mangrove (*Laguncularia racemosa*), occur in this region. Buttonwood (*Conocarpus erecta*), although not a true mangrove, is important in the transition zone between the swamp and upland vegetation (Davis, 1940). The mangrove trees themselves are certainly the dominant producers in the swamps. Algae are also important, especially because their production may be much more quickly consumed by the mangrove fauna than the woody materials produced by the trees. In Florida, open shoal areas below mean low water are often covered by tropical species such as *Caulerpa, Acetabularia, Penicillus, Gracilaris, Halimeda, Sargassum,* and *Ratophora*. Above this region, on the intertidal muds one may find a thick growth of *Vaucheria* or *Cladophoropsis*. There is also a subterranean algal flora composed of unicellular and filamentous blue-green and green algae. The prop roots of the red mangrove have several zones of algae attached to them.

Many kinds of animals are found in mangrove swamps, in sharp contrast to the low diversity of plant species. The most important benthic marine animals are probably crustaceans and mollusks, and most of these can be classified as either deposit or filter feeders. Fiddler crabs (*Uca* spp.) in Puerto Rico frequently are dominant in terms of biomass. The crabs on intertidal flats of mangrove islands in Florida bays include *Uca pugilator, U. speciosa, U. thayeri,* and *Eurytium limosum*. Other species, *Aratus pisonii, Sesarma curacaoense*, and *S. reticulatum*, are abundant in mangroves above high water. Barnacles such as *Balanus eburneus* attach to roots and stems where they can filter their food from the water at high tide. Coon oysters (*Ostrea frons*), also important filter feeders, are abundant on mangrove roots in Florida. The weight of their shells may eventually cause the root to break off. The dead shells and undigested food of these barnacles and oysters contribute to the sediments of the swamp. Several kinds of snails (*Cerithium, Melongena, Cypraea,* and *Littorina angulifera*) feed on material deposited on the roots or on the mud surface. Some vertebrates of the Florida swamps include turtles, crocodiles, alligators, bears, wildcats, puma, and rats.

Other important consumers in Florida swamps are amphipods, isopods, the crab *Rhithropanopeus harrissii,* and fishes, especially *Cyprinodon variegatus, Mollinesia latipinna,* and *Floridichthys carpio*.

Birds are abundant, conspicuous, and probably important in mangrove swamps. Approximately half of the species utilize the swamp for nesting activities and the others feed there or congregate there in large communal roosts. The food resources of the birds are varied. Egrets, herons, ibis, ducks, kingfishes, crab hawks, stilts, and pelicans feed on estuarine fishes and invertebrates; fly-catchers, woodpeckers, wrens, swallows, and warblers feed on insects in the forest; and doves and blackbirds feed on seeds outside the swamps but return for roosting or nesting. The mangroves themselves and their fruits, however, do not directly supply nutrients to birds, and their food supply, like that of the other animals, comes predominantly from marine life in the channels or on the mud flats. The dense nesting colonies in some areas may physically harm the trees, but the excreta are of some nutritional benefit.

Florida mangrove swamps also serve as nursery grounds for many animal species of economic importance–menhaden, black mullet, spotted sea trout, snook, tarpon, red drum, mangrove snapper, pompano, and pink shrimp. Oysters growing on the bottoms of shallow bays or on the mangrove prop roots are also harvested in some places.

b) Salt Marsh

The most extensive areas of salt marsh occur from Tarpon Springs to the Port St. Joe area.

According to Humm (1973), vegetation consists primarily of three grass species, one rush, and several species of forbs.

Salt marsh grass (*Spartina alterniflora*) comprises the most seaward of the vegetation zones where it endures the deepest and longest inundation by saltwater. Black rush (*Juncus roemerianus*) inhabits the next zone inland and therefore occurs on slightly higher ground. This species forms almost pure stands to heights of 6-7 feet and slows down tidal penetration. The third zone inland is dominated by salt grasses (*Distichlis spicata* and *Spartina patens*). This zone is rarely inundated except during high tides.

Annual production of dry organic matter by marsh plants is very large, probably about 2,000 g/m or roughly 20,000 lb/acre) (Odum, 1961; Teal, 1962). The production of a salt marsh is mostly decomposed by bacteria and released inorganic nutrients recycled either in the marsh or in the sea. Some is preserved in the form of salt marsh peat or organic soil. As decomposition by bacteria takes place, some salt marsh organic matter is converted to detritus and a small portion of this is fed upon by small animals before decomposition is complete. This productivity is either dissipated into the marine environment or moves into a variety of food chains. Very few animals feed directly on the salt marsh grasses, but this does not diminish their importance to the ecosystem as a whole, in which they are extremely important.

It is important to note that these areas act as a buffer, storing the tidal waters along with the aperiodic storm waters, dispersing much of the energy before it can reach areas of human habitation. They also act as a catch basin for runoff and pollutants from the upland.

Salt marshes also support considerable populations of rails, sparrows, ducks, numerous shorebirds, and a few reptiles. The area also functions as a hatchery for fish and invertebrates which are essential to the maintenance of the higher vertebrates.

Only small amounts of brackish and fresh marsh are found along the coast of the eastern Gulf of Mexico. These habitats will be discussed in that portion of the EIS dealing with the central and western Gulf of Mexico.

c) Seagrasses

Humm (1973) provides the most recent data on seagrasses of the eastern Gulf. The following narrative is presented verbatim because it best describes the situation applicable to this proposed sale area.

"The inner part of the great continental shelf along the Florida Gulf coast supports the most extensive seagrass beds of the continent of North America. A major stand of these seagrasses occurs from Tarpon Springs northward to Port St. Joe of the Florida panhandle, an area in which the seagrass beds are essentially continuous for a distance of about 250 miles. The gentle slope of the inner shelf in this area is such that these seagrass beds are more than ten miles wide in many places, extending from the intertidal zone out to depths of six to eight meters or more" (Humm, 1973).

Three species make up about 99 percent of the biomass of these seagrass beds: *Thalassia testudinum, Syringodium filiforme,* and *Halodule wrightii*. The relative abundance of these three species is presumed to be in the order given above, based upon general observations of the beds and of the quantity of leaves washed ashore. Quantitative data are available from only a few small areas and are not adequate for interpolation to large areas.

A fourth species, *Halophila engelmanii*, occurs in the beds mixed with *Thalassia*, presumably in relatively small quantity. A fifth species, *Halophila baillonis*, is known only from deeper water north of Tampa Bay and apparently does not occur in the beds. It forms, presumably, small patches at depths of 8-30 m but apparently no one has studied it in the Gulf of Mexico.

A sixth species, *Ruppia maritima*, is present off river mouths, especially in beds of *Halodule wrightii*, but also mixed with *Thalassia*. It is not a true seagrass as its normal habitat is freshwater; however, it extends into the sea in places because it can tolerate considerable salinity.

The seagrass beds between Tarpon Springs and Port St. Joe are probably the most important community of the inner shelf in terms of basic productivity. Apparently they far exceed the basic productivity of phytoplankton in the area they occupy, perhaps several thousand square miles of inner shelf bottom. Their ecological importance, however, is not only their basic productivity; they also provide what may be an essential environment for many species of invertebrates and fishes, including some of economic value in both sport and commercial fisheries.

Humm (1973) also noted that seagrasses exhibited significant environmental functions in the eastern Gulf:

(1). They serve as a sediment trap and a stabilizer of bottom sediments from the waters edge to a depth of 6-16 m or more.
(2). They carry on basic productivity that in the eastern Gulf may considerably exceed that of benthic algae or phytoplankton in the same area.
(3). They serve as a direct food source (fresh) for a few animals, including sea urchins, sea turtles, manatees, and certain herbivorous fishes. Partially decomposed leaves in the form of detritus serve as a food for a wide variety of detritus-feeders, especially invertebrates, but also for some fishes.
(4). They serve as a place of refuge, and as a source of food organisms for juveniles of many species of seafood organisms including shrimp, crabs, bay scallops, and fishes.
(5). They provide a habitat for a certain assemblage of invertebrate species that burrow or grow attached to the leaves - organisms that may be uncommon or absent from habitats that lack seagrasses.
(6). They provide an important substrate for attachment of scores of species and a significant biomass of benthic algae that otherwise would be rare or absent from an area.

d) Estuaries and Embayments

Lyons and Collard (1974) reported on the estuarine habitat for the eastern Gulf of Mexico. What follows is largely from their report.

The single category "estuary" contains much of the first four of Collard and D'Asaro (1973), i.e., "low salinity communities"; "oyster reef communities"; "oyster, mangrove, and hard substrate communities"; and "bays, channels, and sounds". The authors also recognized various subdivisions within most categories based on salinity, temperature, vegetation, and substrate.

It is sufficient to state here that these areas located along most of the eastern Gulf coast, are characterized by salinity gradients generally ranging from 0-34 ppt with broad fluctuations caused by rainfall (or lack thereof), tides, and other factors. Temperature fluctuations are usually much greater than in other marine environments. Substrates may vary considerably, both within a single estuary and between estuaries. Nutrient values are generally higher than in other marine environments.

Of these factors, perhaps temperature and salinity fluctuation and high nutrient values are most characteristic in separating estuaries from other marine habitats; however, substrate and vegetation are just as important in determining composition of communities. All factors are, to some degree, interrelated.

A remarkably high number of benthic invertebrates are adapted to exist under the rigorous conditions of eastern Gulf estuaries. Menzel (1971) noted some 500 estuarine species in the Alligator Harbor, Florida area. More than 600 species occur in the Tampa Bay estuarine system (Taylor, 1971). Much of the Florida west coast may be considered "ecotonal" between temperature and tropical zoogeographic provinces. Such areas, generally high in species diversity, result from occurrence of hardier types from each province. Broadly fluctuating salinities and, to a lesser extent, temperatures are characteristic of these habitats.

The low salinity communities include marshes, deltas, and mangrove swamps, each of which is characterized by low salinity and organically rich sediments. Mangrove communities are dominant in the south but entirely absent in the north, primarily due to low temperature intolerance. *Spartina-Juncus* marshes occur extensively in the north, but much less so in the far south. Both occur south of Cedar Key, but with mangroves increasingly dominant to the south.

The oyster reef-hard substrate community is the major sessile invertebrate community of eastern Gulf estuaries. It is based upon *Crassostrea virginica* throughout the region, but widely diverse temperatures and salinities dictate different species associations at different localities.

Bays, channels, and sounds, though still characterized by broadly fluctuating salinities and temperatures, tend to have overall mean values higher than that of the previously mentioned areas. These factors are still important in determining local species composition, but substrate, vegetation, and depth are also major factors.

Substrates may vary from muds and terrigenous sands and mixtures thereof in the north to vegetable debris and calcareous sands in the far south. Terrigenous sands are not important south of Cape Romano. Quartz sandshell mixtures dominate most of west Florida, but muds become important west of the Apalachee Bay area.

Pure or mixed stands of seagrasses occur in estuaries throughout the region. Species include *Thalassia, Syringodium, Halodule,* and *Ruppia.* Two species of *Halophila* are less common. Most of these grasses reach their greatest densities in estuaries, but in this area they are generally limited to depths less than 2 m because of poor light penetration. This leaves greater estuarine depths as nonvegetated substrate inhabited by species not tied to a "grass bed" existence.

Generally, estuaries are herein considered as coastal invaginations, often separated from the Gulf of Mexico by barrier islands. However, certain shallow areas of low wave energy display typical estuarine characteristics. These include extensive shorelines from Apalachee Bay to the Anclote Keys and, further south, the Ten Thousand Islands area from Cape Romano to Cape Sable. These seem to represent estuaries intergrading directly into shallow shelf communities.

1) Coastal Habitats of the Central and Western Gulf of Mexico

a) Salt Marsh

Salt marshes exhibit distinct zonation according to the dominant plants. This zonation is controlled by a variety of factors including soil types, soil salinity, tide, elevation, drainage characteristics, and pH. The extent of saline intrusion into the marsh depends to a large degree on the rate of percolation (movement through soils) of saltwater at high tide, and the location of points of influx of freshwater from the mainland. On the Louisiana coast, the saline marsh is generally adjacent to the beach rim and may vary from 2-24 miles in width.

The comparatively small number of plant species of the salt marsh limits the number of available niches in which organisms may live. Only 17 plant species have been recorded from the coastal salt marsh of Louisiana, with salt marsh cordgrass (*Spartina alterniflora*) being the dominant species (Chabreck, 1972). However, with the inland marsh succession, habitat complexity increases significantly.

Salt marsh cordgrass (*Spartina alterniflora*) comprises the most seaward of the vegetation zones where it endures the deepest and longest inundation by saltwater. Black rush (*Juncus roemerianus*) inhabits the next zone inland and therefore occurs on slightly higher ground. This species forms almost pure stands to heights of 1.8 to 2 m and functions to slow down tidal penetration. The third zone inland is dominated by salt grasses (*Distichlis spicata*) and wiregrass (*Spartina patens*). This zone is rarely inundated except during high tides.

Salt marshes support considerable populations of rails, sparrows, ducks, numerous shorebirds, and a few reptiles. The area also functions as a hatchery for fish and invertebrates which are essential to the maintenance of the higher vertebrates.

b) Brackish Marsh

Brackish marshes are usually situated between the seaward salt marsh and landward intermediate and freshwater marshes. These brackish marshes are located extensively in southeastern Texas and the coast of Louisiana.

Salinities vary annually between an average low of 3.4 ppt to an average high of 16.7 ppt. Highest salinities occur in June, or in the drought period.

Plant species diversity increases as one approaches the upland environment from the marsh. Forty species of plants have been recorded in the brackish marsh. The dominant species wiregrass, comprises 55 percent of the total vegetation. Salt grass comprises 13 percent of the remaining 39 species. Only five other species have been recorded with coverage greater than 2-5 percent.

c) Fresh Marsh

Predominant freshwater marsh in the area is situated in the more central region of the Mississippi Delta near the distributary passes. Major species of vegetation in this marsh are: roseau cane, Eurasion water milfoil, alligator weed, duck weed, water hyacinth, dogtooth grass, bulltongue, pondweed, and maiden cane.

A substantial freshwater wetland system exists throughout the central Gulf coast region. Freshwater marshes in coastal Louisiana exhibit greater species diversity while comprising approximately 34 percent of the wetlands in the coastal zone (Chabreck, 1972).

d) Seagrasses

Seagrasses consist of species of flowering plants that grow completely submerged (some are tidally emergent) in brackish to saline waters. They are limited to water where sunlight penetration permits photosynthesis, such as are found in the shallow waters of bays and around islands in areas of low turbidity.

Marine grass beds support one of the highest biomass densities in the marine environment. They not only provide a valuable food source for migratory waterfowl and shorebirds, but also provide prime nursery grounds for shrimp, crabs, and fishes of all types. While few animals feed on the grasses, many feed on organisms which attach to or live on them; viz., snails and mussels.

Seagrass communites are fragile ecosystems which advance and decline readily in response to minor changes in water quality, turbidity, or sediment loads and are vulnerable to storm damage. The largest of these marine meadow communities in Louisiana is located immediately west of the Chandeleur Islands from Whitehouse Point south to the area of Polo Island. Species include *Syringodium filiforme, Thalassia testudiunum, Halodule beaudetti, Halophila engelmanni,* and *Ruppia maritima*. Extensive areas of the Laguna Madre in Texas are carpeted by *Halodule beaudetti* while *Ruppia maritima* is common in sheltered coves. *Thalassia testudinum* is limited to areas of the southern Laguna Madre in the laguna; *Syringodium filiforme* is less common, but is increasing its range to the northward in the laguna. *Thalassia* and *Halodule* are common in estuaries of the central Texas coast, while *Ruppia* and *Halodule* are most common along the east Texas coast. Data are not available on other seagrass communities in this proposed sale area.

e) Estuaries and Embayments

Estuaries and bays are highly productive ecosystems. It is estimated that 97.5 percent of the total commercial fisheries catch of the Gulf States is made up of fresh and shellfish species that spend at least a portion of their life cycles in the estuaries (Gunter, 1967). They receive nutrients from upland areas via major river systems, especially during spring flooding. They also receive the nutrient wash-out from tidal flushing of the salt marsh, particularly during mid-winter when marsh grass of the previous season is decomposing. The dynamics of this system applies to the estuarine areas of Texas, Louisiana, Alabama, and Mississippi.

b. Habitats and Resources of Special Concern

Based on an inventory of known and existing coastal archaeological sites and the projected sea level transgressions, Paleo-Indians could have inhabited what is now the continental shelf as long as 18,000-20,000 years ago. Direct evidence of specific inundated prehistoric sites has not been documented on the Gulf of Mexico OCS to date with the exception of a few shallow water, nearshore sites bordering the existing shoreline. This lack of documented sites is due mainly to lack of investigations; however, numerous prehistoric sites have been documented by investigators on the Pacific OCS.

Approximately 1,629 potentially significant historic shipwrecks are known to have gone down in the Gulf of Mexico between 1500 and 1945. Of these wrecks, 1145 are pre-20th century. Only 23 of these pre-20th century wrecks have specific locations given by latitude and longitude. the *USS Hatteras* off Galveston, the *USS Tecumseh* near Mobile Bay, the *San Jose* in southern Florida, and the *El Constante* off western Louisiana are the only known shipwrecks in the Gulf of Mexico currently in the National Register of Historic Places.

Evidence of prehistoric occupation of the coastal area of the Gulf of Mexico region from the earliest Paleo-Indian period until the first European contact is found throughout the area from the tidal zone landward. Rudimentary sites from early cultures and larger habitation sites and burial complexes from the later periods are also located in considerable numbers.

The coastal areas of the Gulf states have been prominent in American history from earliest colonial times. The region contains many buildings, structures, and sites that are important to the preservation of American history, architecture, and culture. The majority of these are located inland from the surf/tidal zone and would be unaffected by any OCS-related activity. Coastal fortifications and lighthouses typify historical sites found within the surf/tidal zone and are often protected by various means such as bulwarks or other barriers.

The beaches and coastal marshes of the Gulf have numerous species of shorebirds and wading birds. The coastal zone of the northern Gulf of Mexico provides some of the best waterfowl wintering habitat in North America. Of all these areas the coastal marshes and rice fields of Louisiana constitute one of the largest general waterfowl wintering areas within the United States. Waterfowl also overwinter in the Mobile Bay, Apalachicola and Suwanee rivers area, and the coastal area between Apalachicola and Tarpon Springs. Seabird rookeries occur in numerous locations along the coast.

Several endangered wildlife species occur in the coastal region including: the brown pelican, bald eagle, five species of marine turtles, West Indian (Florida) manatee, Mississippi sandhill crane, American alligator, and crocodile. whooping crane, and peregrine falcon. Critical marine habitat areas have been designated for the endangered Florida manatee in the State of Florida by the Fish and Wildlife Service.

The Gulf of Mexico coastal region has a high potential for the occurrence of air pollution problems in those locations with high population and industrial concentrations where existing air quality is at or near non-attainment status. These locations have frequent air pollution episodes which could pose either short-term or long-term health hazzards. Air quality over most of the Gulf coastal zone is good with pollutions problems generally confined to the Central and Western Gulf Coast in and around heavy industrial complexes (40 CFR Part 81.3).

The northern Gulf of Mexico coastal zone is one of the major recreational areas of the United States, particularly shorefront activities such as saltwater fishing (surf and pier) and beach related activities. The coastal areas from southwest Texas to southern Florida display a diversity of natural landscapes and seascapes. Barrier islands, sandy beaches, bays, sounds, river deltas, and marshes along with a subtropical climate provide an ideal setting for outdoor recreation and tourism. Publicly-owned and developed areas like state parks, national seashores, and wildlife refuges; privately developed areas such as resorts, amusement parks, and marinas; and specially designated preservation areas such as historic and natural sites and landmarks, wilderness areas and scenic rivers attract millions of residents and nonresidents annually to the Gulf of Mexico coastal zone.

Tourism based on coastal recreational resources, amenities, and support services is a vital part of the economy of many coastal communities and resorts along the Gulf coast.

The Gulf coast has a wide variety of outdoor recreational opportunities which are primarily focused on (or oriented to) the region's coastal wetlands and barrier islands. About 20 percent of the Gulf coast shoreline is dedicated for recreational activities (13 percent private and 7 percent public). The three national parks, over 32 state parks, and numerous county and city recreational sites provide an abundance and wide variety of recreational opportunities such as swimming, boating, fishing, picnicking, sightseeing and people watching, nature study, and camping.

The Gulf coast wetlands are of special concern from both an environmental and economic standpoint because they are vital not only to reproduction and breeding grounds, flood plain protection, erosion control, and wildlife habitat, but also for aesthetic and recreational purposes. Numerous federal and state conservation/wildlife management areas and preserves have already been established that serve to protect large areas of the Gulf coastal zone from intense develop-

ment pressures. In Florida, a statewide system of aquatic preserves has been established to set aside certain exceptionally valuable areas for perpetual public enjoyment and to preserve important natural ecological systems.

6. Socioeconomic Factors

a. General Description

This region includes all of the coastal counties/parishes along the Gulf of Mexico, and includes portions of Alabama, Florida, Louisiana, Mississippi, and Texas. The area is one of varied socioeconomic patterns ranging from low-density rural or undeveloped areas to high-density urban centers. The economy has generally shifted from agriculture into other industries; however, industrial development has been moderate to light. Oil and gas activity, tourism and recreation, commercial fishing, and port operations represent the major coastal activities.

b. Factors of Particular Concern

1) Eastern Gulf

This region includes the entire Florida Gulf of Mexico coastal area. The Standard Metropolitan Statistical Areas (SMSA's) which occur in this region are, in east to west order:

SMSA	1980 Population
Fort Myers	204,314
Sarasota	201,731
Bradenton	146,048
Tampa - St. Petersburg	1,550,035
Tallahassee	157,076
Panama City	97,175
Pensacola	284,408

All of these SMSA's have undergone significant growth since 1970; the overall population change in these cities over the 1970-80 period was 24 percent.

The infrastructure for oil and gas development remains largely undeveloped in the eastern Gulf due to the lack of economically recoverable hydrocarbon resources. Support bases have occurred at Panama City and Port Manatee in service to past and ongoing exploration activity. These bases are small and would require expansion should a major discovery of oil and gas occur in this region. There are also two refineries in this region at the present time located in Wakulla and Manatee Counties. No additional refineries are currently proposed for this area.

Tourism and recreational activity in this area is estimated by many to be its most important economic asset. In Florida, tourist-generated business receipts were estimated to be $16.1 billion in 1980 with associated state tax revenues of over $785 million, according to the 1980 *Florida Visitor Study* prepared by the Florida Division of Tourism. The tourist-generated employment was estimated to be 580,200, or about 16.0 percent of Florida's total work force in 1980. Of the top ten counties for visitor destinations, including both air and automobile travelers, half were Gulf coast counties: Pinellas County (3,640,300 visitors); Hillsborough County (2,084,400); Escambia County (1,557,500); Bay County (1,463,100); and Okaloosa County (1,044,900).

About 65 percent of all the visitors surveyed indicated that the Florida beaches were among their primary interests in the area. Other attributes of Florida which ranked highly among the surveyed tourists were general rest and relaxation, such as Disney World, fishing, and water sports.

The port of Tampa represents Florida's largest port and is also the eighth largest in the nation. In the first five months of 1980, exports of $1.0 billion and imports of $1.6 billion were moved out of or into the Tampa Customs District. Together with Port Manatee and Panama City the eastern Gulf region has access to worldwide ocean shipping. The Gulf Intracoastal Waterway also furnishes additional inland shipping capabilities.

2) Central Gulf

This region includes the coastal portions of Louisiana, Mississippi, and Alabama. The SMSA's which occur in this area are, in east to west order:

SMSA	1980 Population
Mobile	449,700
Pascagoula - Moss Point	123,800
Biloxi - Gulfport	177,800
New Orleans	1,158,700
Baton Rouge	457,700
Lafayette	137,800
Lake Charles	160,000

All of these SMSA's have undergone growth since 1970; the overall population change in these cities over the 1970-80 period was 16 percent.

The infrastructure for OCS oil and gas production in this area is the most developed in the world. It includes oil refineries, petrochemical and gas processing plants, supply bases for offshore service, platform construction yards, pipeline yards, and other oil/gas-related installations. This activity is primarily located in coastal Louisiana. In addition to existing facilities, new or expanded service bases, refineries, and gas processing plants are proposed for the lesser developed portions of the eastern Gulf, particularly Mobile.

Commercial shipping in this region includes one of the busiest ports in the nation, New Orleans. In the first five months of 1980, over $8.0 and $9.5 billions in exports and imports, respectively, were moved out of or into the New Orleans Customs District. Also, the Mobile Customs District recorded almost $1.1 and $1.3 billions in exports and imports, respectively, in that same period. New Orleans leads the nation in grain exports; in regards to imports, it is one of two leaders in the receipt of petroleum products, primarily crude oil. Many smaller ports handle the large commercial fishing and recreational fleet of the central Gulf of Mexico. Intracoastal shipping is provided by numerous waterways, all connected to the Gulf Intracoastal Waterway, which traverses the entire region.

Tourism within the central Gulf region generally surrounds such activities as sightseeing, conventions, sports, festivals, swimming, and sunbathing. Primary activity in Louisiana is situated in Orleans Parish, which accounted for about $984 million in travel expenditures in 1976. Jefferson and East Baton Rouge parishes also receive significant amounts of tourists and related expen-

ditures in each area. According to a study prepared for the Alabama Bureau of Publicity and Information, tourist-related travel expenditures in Alabama amounted to about $2.2 billion in 1979 (Adams, 1979). At least 10 percent of these visitors cited activities along the Gulf coast as their major interest, e.g. swimming and sunbathing. Also, data from the *Mississippi Deltaic Plain Ecological Characterization Study* (Larson et al, 1980) indicates that tourism along the Mississippi Gulf coast generated about $17.3 million in receipts from 2.9 million out-of-state visitors in 1980. Harrison County accounted for 95 percent of this activity. The main attraction is the white sand beach along the Pass Christian Biloxi stretch of coast.

3) Western Gulf

This region includes the coastal portion of Texas. The SMSA's which occur in this area are, in east to west order:

SMSA	1980 Population
Beaumont - Port Arthur - Orange	366,100
Galveston - Texas City	203,200
Houston	2,761,300
Corpus Christi	304,200
Brownsville - Harlinger - San Benito	181,600

All of these SMSA's have undergone significant growth since 1970; in fact, this region represents the fastest growing area in the entire Gulf coastal zone. The overall population change in these cities over the 1970-80 period was 30 percent.

The infrastructure for OCS oil and gas production in this region is generally a continuation of such activity previously discussed for the central Gulf area. Support services and facilities occur primarily from Sabine Pass to Corpus Christi with a lesser concentration of activity to the south of this area. The predominant feature of this development is oil/gas refining and processing. In addition to the numerous existing refineries and gas processing plants, there are also several expansions or new facilities currently proposed in this region. OCS-related development in the Western Gulf has generally occurred subsequent to an already extensive network of facilities related to onshore oil and gas production.

Commercial shipping in the western Gulf is centered around Houston, which ranks first in the United States for its exports of chemicals and allied products. In the first five months of 1980, over $5.2 and $4.3 billions in exports and imports, respectively, were recorded for the Houston Customs District. The Galveston District accounted for $1.7 and $4.5 billions in exports and imports, respectively, in that period; Port Arthur recorded such export and import amounts of $0.8 and $4.3 billions, respectively. As in Louisiana, many smaller ports handle the large commercial fishing and recreational fleet of the Gulf of Mexico, and inland transportation is greatly facilitated by the Gulf Intracoastal Waterway.

Tourism within the western Gulf region also surrounds activities similar to those discussed for the central Gulf. The primary tourist center is Harris County, which includes Houston, where over $1.3 billion in travel expenditures occurred in 1978. Other centers of tourism in the region include Galveston and Corpus Christi, where access to Gulf beaches is considered an important asset to visitors.

Tourism is an increasingly important part of the economies of the Gulf states. Much of the tourism and recreational activity is oriented around the beach and ocean. Tourism and the recreational support industries are a major component of the economies within the coastal zones of all five Gulf states. The southwest portion of Florida (Eastern Gulf area) and southern Texas (Western Gulf area) are more firmly entrenched, however, in the tourist/retirement economies closely tied to the natural resources and amenities or tropical recreational environment of the marine coastal shorefront.

The northern Gulf of Mexico is our nation's most diversified sports fishing marine environment endowed with an extensive system of small and large bays, sounds and estuaries, bayous, barrier islands, and coral reefs. In 1975 the Gulf of Mexico was responsible for 35 percent of the total national economic activity related to saltwater fishing. There is a large tourist as well as resident demand for deepsea recreational fishing in the Gulf of Mexico, and over 500 boat-for-hire businesses are accommodating this need from the towns and resort communities bordering the Gulf of Mexico shoreline. Most of the marine recreational fishing and scuba diving are focused around the natural and artificial reefs known to exist in the Gulf of Mexico. Natural and over 100 artificial reefs constructed specifically to attract fish are the prime recreational destination areas in the eastern Gulf, whereas the more than 3,000 oil and gas structures mainly ff Louisiana, and a few artificial reefs specifically developed to attract fish are the focus of recreational fishing interest and scuba diving in the central and western Gulf of Mexico.

Port uses in the western Gulf are merely adapted to OCS activity, but the small ports of the eastern Gulf might have some problems in accommodating fishing, pleasure craft, and supply boats.

C. Pacific Region

1. Geology

As of January 1, 1978, there were 13 fields in the federally controlled portion of the Pacific OCS recognized as producing or capable of producing hydrocarbons. All of the fields are located in Southern California; 12 in the Santa Barbara Channel, and a single field in the San Pedro Basin. Seven of the fields are oil fields and six are a combination of oil and gas. As of January 1, 1982, none of the fields in the Southern California OCS were fully developed. Of the 13 recognized fields in Federal waters, Dos Cuadras Offshore, Carpinteria Offshore, Santa Ynez, Beta, and Santa Clara, have platforms installed and are now producing.

Potential petroleum offshore of Southern California is extrapolated largely on the basis of development of analogous onshore regions. Further information comes from such geologic parameters as thickness of Neogene sediments, burial and thermal history, limited exploratory drilling, and structural characteristics and trends. The continuation of favorable onshore stratigraphic and structural trends has been confirmed in the Santa Barbara Channel. Fractured marine shales and numerous potential structural traps have been identified, along with thick sandstone sections that offer good reservoir capabilities.

The potions of offshore Central and Northern California that were considered for the proposed OCS Lease Sale No. 53 included parts of five seperate provinces of the Pacific Coast offshore region. These provinces are, from north to south, Eel River, Point Arena, Bodega, Outer Santa Cruz, and Santa Maria Basins. Offshore oil and gas development has not occurred, to date, in these basins. Hydrocarbons encountered in offshore exploratory drilling during the 1960s were not deemed economic under prevailing economic conditions at the time. Most targets have been structural rather than stratigraphic traps. Four of the offshore areas in this region (Santa Cruz, Santa Maria, Bodega, and Eel River) lie adjacent to onshore basins. Petroleum production from all of these onshore basins has been relatively small.

The Southern California Borderland, Transverse Range Province, and North Central California Coast are cut by numerous faults, many of which are identified as active because they either cut the seafloor, cut young sediment (<11,000 years old) or can be correlated with historic seismic events. Much of the faulting in Northern California is related to motion along the San Andreas and associated fault zones. At least one basin (the Eel River) overlies an active plate subduction zone capable of generating large magnitude earthquakes.

In the Transverse Range Province, at least six earthquakes of magnitude 6 (Richter scale) or larger have occurred within the last 60 years in the Santa Barbara Channel or adjacent structural provinces. Similarly, the Borderland Province is cut by numerous active faults and major historic seismic events.

Evidence for seafloor instability in the form of slumps and slides are found in many of the California offshore basins, though, generally, there are insufficient data to establish the presence or absence of such activity. In addition, hydrocarbon seeps characterize many of the basins, and while not inherently hazardous themselves, may produce clues to the location of fractured reservoir rocks and shallow over-pressured gas pockets that can pose a danger to drilling operations.

2. Physical Oceanography and Meteorology

The prevailing winds along the California coast are generally from the northwest averaging between 10 and 20 mph. In those locations where the coastline is oriented east to west, the winds shift to a west-southwest direction. In the summertime, the winds become slightly more onshore. This pattern, combined with a persistent temperature inversion, tends to trap any surface-generated emissions within the marine air layer and transports them onshore. In the urbanized coastal areas, these meteorological conditions favor high air pollution concentrations. The most severe air pollutant is photochemical oxidants or "smog" which results from the reaction of nitrogen oxides and hydrocarbons in the atmosphere.

A current, the outer limit of which extends offshore more than 300 miles, flows approximately parallel to the Pacific Coast of the United States from 50° to 30° north latitude. The direction of the current is generally southward throughout the year except as noted below. Its velocity, which averages about 02. knot, is greatly influenced by prevailing winds. North of latitude 45° the set is usually northward from November through February. Along the coast, during certain periods, there is a weak northerly flow which is evident between San Diego and Point Conception from July through February, and between Point Conception and Cape Flattery from November through February.

Although the coast of California is not generally subject to waves of the magnitude which strike the Hawaiian Islands and other Pacific areas, widespread damage to shipping and to waterfront areas occasionally occurs, as a result of tsunamis. The maximum wave height of the 100-year wave has been estimated to be approximately 10 meters.

3. Marine Habitats and Resources

a. General Description

The most significant characteristic of Pacific coast plankton ecology is upwelling, which occurs during the spring (April or May) in Southern California and later in the summer on the rest of the coast. The subsurface water is cold (10°C) and rich in the nutrients which rise to the surface of the coastal waters during periods of upwelling. The combination of abundant nutrients and adequate sunlight allows prolific phytoplankton growth (up to several million cells per liter during blooms) in the upper 50 meters of water. Although diatoms are the most numerous group, red tide blooms are typically caused by dinoflagellates. Some red tide dinoflagellates emit toxins that can kill marine organisms or concentrate in filter feeders consuming the donoflagellates. An example is the mussel poisoning species *Gonyaulax catenella* which is restricted to the waters north of Point Conception, California on the Pacific coast. Zooplankton abundance is closely related to the biomass of phytoplankton, as the latter serves as the primary food source for zooplankton. Therefore, zooplankton abundances follow phytoplankton abundances, although with a characteristic lag of several weeks, representing an exploitation and utilization phase of the plants by zooplankton.

Off Central and Northern California, the continental shelf gradually slopes downward in a typical fashion, although it is occasionally cut by submarine canyons. As the depth increases, sediment tends to become more fine, contributing to a greater proportion of filter feeders (organisms which strain plankton out of the water) near shore and more detritus feeders (organisms which feed on or in the bottom) near the outer portions of the shelf. Little work has been done in Central and Northern California, but Carey (1972) reported that in Central Oregon the epifauna changes from a sparse molluscan assemblage to one dominated by numerous echinoderms and arthropods. The infauna demonstrate a seaward variation in species composition; arthropods are dominant close to shore; and polychaetes are dominant offshore. Abundance increases seaward; the largest numbers and greatest biomass of both epifauna and infauna are found at the outer edge of the continental shelf. In Southern California, the topography and the bottom community is more complex. Species composition tends to change with depth. Assemblages of marine canyons show some isolation, as do the basins to an even greater extent. Throughout the Pacific coast, there are scattered hard bottoms containing assemblages limited to the bottom surface. These assemblages are believed to be more sensitive to oil operations.

The Pacific continental shelf nekton are strongly associated with the California Current and the coastal upwelling of nutrient rich waters. Presently, the most numerous epipelagic fish of the California Current throughout California is the northern anchovy, although the Pacific herring is abundant in the Pacific Northwest. The midwater fauna off Southern California is especially complex because it contains species from three converging water masses (Pacific Subarctic, North Pacific Central, Pacific Equatorial) as well as species endemic to the California Current system. Specific groups of species are associated with each of these water masses.

Five hundred and fifty-four species of coastal marine fishes have been identified as occurring in California. The number of species decreases in a south to north direction.

b. Habitats and Resources of Special Concern

The majority of habitats of special concern are associated with the onshore or shallow area. However, scattered along the Pacific continental shelf, usually near its outer edge, are shallow, rocky banks rich in attached organisms and associated fish. In Central and Northern California, areas possibly fitting this category are St. George Reef near Crescent City, Tolo Bank south of the Mendocino Peninsula, Cordell Bank off Point Reyes, and areas around the Farallon Islands off San Francisco. In Southern California, shallow banks include the offshore Tanner and Cortes Banks, Osborn Bank, and Farnsworth Bank, although the latter is very close to shore. All of these Southern California banks are notable for their populations of "purple coral", *Allopora californica*. Although these populations of *Allopora* occur in the Monterey Canyon, its distribution in Central California is not well-known.

Coastal California is the transition area of southern subtropic waters and northern temperate waters. The range of many southern and northern marine mammals and seabirds species overlap in this area. This results in a highly diverse population of marine animals throughout coastal California. Nowhere else in the world is the pinniped (seals and sea lions) species diversity so great as off the coast of California where six different species may be found. Of the more than 80 species of cetaceans (whales, dolphins, porpoises) in the world, 27 are found in California coastal waters. The California sea otter, a marime mammal, has come back from near extinction and now numbers about 2,000 animals and continues to expand its range off California's central coast. Significant pinniped rookeries exist in the Northern Channel Islands, Ano Nuevo Island, the Farallon Islands and Castle Island. The offshore rocks, cliffs and islands of California provide nesting and resting habitats for many species of seabirds. Nineteen seabird species nest in the California coastal area. Over 50 percent of the seabird breeding population of the State breed on the Farallon Islands and Castle Island.

The Pacific coast has seven endangered whale species, the endangered brown pelican, and the threatened southern sea otter. In addition, several species of sea turtle are occasionally sighted in coastal waters.

Recently completed and ongoing studies supported by BLM and other agencies have provided useful information on the distribution and abundance of marine mammals and seabirds. This information was used in the analysis of impacts on these resource categories (see Sections V.D.7 and 8).

4. Other Uses of the OCS

a. General Description

Some of the major activities which compete with the petroleum industry for the use of the outer continental shelf are military, shipping, commercial fisheries, and sport fisheries. Other important activities which compete for the use of the outer continental shelf include kelp harvesting, mariculture operations, marine sanctuaries, deep water ports, coastal parks, and offshore dumping.

The military utilizes most of Southern California waters, and approximately 50 percent of Central and Northern California waters for fleet training, flight training and exercises, in addition to numerous other uses.

The extent of the shipping is difficult to document; however, most coastal traffic is likely to be within 30 miles of the coast. Relatively high traffic areas occur in the Santa Barbara Channel and near large ports such as Los Angeles and San Francisco. Commercial and sport fisheries use virtually all of the waters of the continental shelf.

b. Uses of Particular Concern

Shipping is a competing activity of the outer continental shelf. However in the future if proposed coastal traffic separation schemes are adopted and accepted, shipping conflicts will be reduced. Deep water ports have been proposed for very large tankers at Port Angeles, Washington, and Long Beach, California, although no applications for such ports are pending with the Department of Transportation; a liquefied natural gas port is also proposed for Point Conception.

Commercial and sport fisheries are also an important competing outer continental shelf activity. In 1980, landings for the California commercial fishing fleet (including shellfish) of 804 million pounds valued at $323 million (U.S. Dept. of Commerce, 1981a) were reported for marine waters within 200 miles of the coast. A much greater value may be placed on these fisheries if the total landings figures include those catches made outside the United State's 200-mile Economic Zone. IN 1980, one-seventh of the total U.S. landings were reported from California. The value of the sport fisheries is difficult to determine; however, its importance should probably be considered on a par with commercial fisheries since the indirect economic value must be considered in addition to the value of the actual landings.

In California waters, there are 34 Areas of Special Biological Significance (California State Water Resource Control Board, 1976), and several coastal and island oil and gas sanctuaries (extending 3 miles offshore). (Oil and gas sanctuaries are areas where oil and gas development is prohibited.) There are also more than 120 State parks, National parks, or National forests along the west coast between Canada and Mexico. The most significant aspect of marine parks and sanctuaries with respect to OCS oil and gas development, however, are the designated and proposed National Marine Sanctuaries. The Channel Islands and Point Reyes-Farallon Islands National Marine Sanctuaries were designated in early 1981 (Federal Register, 1981a, b, c). Two other areas, Monterey Bay and Cordell Bank, have been proposed as areas for consideration as Marine Sanctuaries.

5. Coastal Habitats and Resources

a. General Description

The Pacific California Coast can be viewed in three (3) regions -- Southern, Central and Northern California. The 1,072 miles of mainland coastline, excluding the San Francisco Bay, and its 300 or so miles of offshore channel island coastline is subject to the jurisdiction of 15 countries, 45 cities, 42 state and 70 federal agencies. Urban development is promarily concentrated in Southern California and the San Francisco Bay area, the major population centers being San Diego 1,585,000; Los Angeles 10,350,000; and San Francisco 4,592,000 (1977).

The remaining coastal development of the State is widely distributed along the coastline. Natural limitations to development, such as rocky promontories and precipitous cliffs, have much of the shoreline in a natural state, precluding development. Coastal access has been restricted by these same landforms and by ownership patterns. Occasional pocket beaches, areas of sandy beaches backed by marine terraces and rugged seacliffs, shoreline backed with steep mountains, rocky beach areas, wide river valleys and deltas, and lagoons and bays all constitute the shoreline type of the Pacific coast. In addition to the resident bird population, during the autumn and spring, large numbers of seabirds, waterfowl, loons, grebes, shorebrids and other types of birds migrate along the "coastal flyway" of California utilizing the bays, estuaries, lagoons and other remaining wetlands of California.

Air quality in the coastal sections adjacent to major California urban areas is frequently poor. Air pollution by photochemical oxidants is particularly severe along the coasts between Santa Barbara and San Diego, and near San Francisco. Except near major industrial sources, air quality in nonurban areas along the California meets Federal and State standards.

The cultural heritage of the Pacific coastal region is lengthy and diverse. Although there is some lack of agreement among anthropologists regarding the date of mankind's entry into North America, human remains have yielded a variety of dates providing evidence of human occupation perhaps as early as 40-50,000 years ago. About 10,000 years ago a population known as the Paleo-Indians developed and were the ancestors of historic and present-day Native American populations. The first European contacts were made by Spain and England during the sixteenth century; formal Spanish rule ended in 1846. Russian influence began in 1812 with the establishmen of Fort Ross. The influx of peoples from many areas of the world has continued. There remains a large number of both Native American and other ethnic groups that continues to maintain distinctive identities, making this region rich in cultural diversity. As a result of the very long period of occupation, the Pacific coastal area is rich in prehistoric and historic cultural resources both on land and on the ocean floor. Rises in sea level during the last few thousand years may have destroyed many early coastal prehistoric sites. However, a great many artifacts have been recovered in Southern California by divers and during extremely low tides. It is probable that the ocean floor contains some Paleo-Indian remains yet to be discovered. The Pacific Ocean also contains thousand of documented and suspected shipwrecks off the California coast. Terrestrial archaeological sites are numerous, representing many periods of occupation. Coastal archeological sites are particularly well documented in San Luis Obispo, Santa Barbara, and San Diego Counties. Historic sites are also numerous, many of which are designated state landmarks and/or National Register Historic sites.

b. Habitats and Resources of Special Concern

Of particular concern in the California coastal region are wetlands (see Sections V.D.7.a.2)a)iii, V.D.8.a.2)a)i, V.D.8.a.2)a)iii and V.D.7.a.2)d)i). The decline in quality and number of wetlands in California increases their value and need for protection from further degradation.

6. Socioeconomic Factors

a. General Description

The Pacific region contains areas that have experienced some significant past and present OCS development activities (Southern California) and a large frontier area where no OCS development has taken place. Much of the onshore development in the Pacific region has also been in the inland Central and coastal Southern California. Because of this, the existing oil and gas infrastructure is concentrated in the Southern California region.

Because of their moderate year-round temperatures and other resource attributes, the coastal counties of California contain a significant concentration of the State's population and economic base. The State's large population centers are in the coastal area–the San Francisco Bay area in Northern California and the greater Los Angeles/San Diego area in Southern California. All of the large population/commercial centers in California have broad-based economies with light and heavy industries and comprehensive service sectors. There are extensive coastal areas where local or regional industries predominate, such as commercial fishing, lumbering, or recreation/tourism. These smaller regional economies are often centered around a smaller port area in the region (e.g., Eureka, Bodego Bay, Monterey, Morro Bay).

b. Factors of Particular Concern

The extent of existing petroleum-related industries varies widely throughout the region. There are a significant number of oil and gas processing facilities in the greater Los Angeles Basin, extending up into the onshore area off the Santa Barbara Channel. Facilities for platform fabrication exist in several areas of the region, the most important being the San Francisco Bay area, but also including the Puget Sound, Portland, and the Los Angeles/Long Beach areas. The bulk of the region's petroleum refineries are in California. California has crude capacity of about 2,634,075 barrels/calendar day with about 53 percent of the capacity in Southern California and the remaining 47 percent in Central and Northern California (1981).

There are lands and landmarks along the Pacific coast, including those with plans and animals traditionally gathered for ceremonial purposes that have religious significance for Native Americans. Areas of known concern to Native Americans include Point Conception, Diablo Canyon, Westport, Point Arena, Trinidad, Partick's Point, Big Lagoon, Eel River, and the Klamath River.

Additionally, public access to the coast, recreation, and development needs (especially for coastally dependent land uses) are of special concern in the region.

D. Southern Alaska Region

The Southern Alaska Region includes the following planning areas: Gulf of Alaska, Cook Inlet, Kodiak, and Shumagin.

1. Geology

Hydrocarbon Potential and Production History: The Southern Alaska Region includes the Alaskan Pacific-margin tertiary petroleum province, the Alaska Peninsula-Cook Inlet Province and the Shumagin continental shelf in the western Gulf of Alaska.

The Alaskan Pacific-margin Tertiary province is a 900 mile long structural feature that roughly parallels the southern Alaska coast between Cross Island and Chirkof Island. This area covers approximately 103,600 square kilometers (40,000 sq. mi.), mostly offshore, and is divided into two sub-provinces, the Gulf of Alaska Tertiary Basin to the east and the Kodiak Tertiary Basin to the west. The Pacific-margin province is bordered to the north and partially underlayed by pre-Tertiary rocks that form an effective basement for Tertiary strata. The Tertiary sequence is broadly divided into a thick lower amount of well-indurated, intensely deformed rocks of mostly Palocene and Eocene age, and an upper unit of less deformed and indurated rocks that are largely of Olegocene through Pliscene age. A more detailed description of the geology can be found in AAPG Memoir 15, Volume 1, 1971 (George Plafker). Subsurface structures that could serve as potential hydrocarbon traps are present. However, no commercial discoveries have been made to date in the offshore areas of this petroleum province. Eleven unsuccessful exploratory holes have been drilled in the Northern Gulf of Alaska (sale 39). No drilling activity has taken place in the Eastern Gulf of Alaska (sale 55).

OCS lands in the Lower Cook Inlet-Shelikof Strait are part of the Alaska Peninsula-Cook Inlet petroleum province. This regional area includes a long, narrow wedge of moderately deformed classic rocks of late Mesozoic and Tertiary age. To date, all commercial oil and gas production has been restricted to Tertiary rocks in upper Cook Inlet. Ten unsuccessful exploratory holes have been drilled within the sale DI area. No drilling activity has taken place on the tracts leased within the sale 60 area.

Two structural basins have been outlived by geophysical data on the Shumagin continental shelf in the Western Gulf of Alaska. The Shumagin Basin, with an area of 1800 kn^2, is located between the Semidi and Shumagin Islands. It is a structural depression which contains presumed Cenozoic sediments as thick as 2.5 km. This section is underlain by complexly deformed sedimentary beds of probable late Cretaceous to early Tertiary age. The Sanak Basin is located northeast of Sanak Island and covers an area of approximately 1200 km^2. This feature, which is an elongated fault-bound basin, contains sediments of presumed Cenozoic age that may be more than 7 km thick. Available data suggest that strategraphic and structural traps are present in both basins. However, it is insufficient to determine the number and hydrocarbon potential of these structures.

Geologic Hazards: The principal potential hazards in the Southern Alaska Region are the results of the subduction process related to the convergence between the Pacific and North American plates. The entire region is one of the most active seismic zones in the world. Numerous active volcanoes are present along the convergence zone and by nature are generally the explosive type. Hazards related to earthquakes and volcanism are lava flows, ash falls, mudslides, tsunamis and seiches. Other hazards in the area are slumping, faulting, displacements of the seafloor, dynamic bedforms such as sand waves and scattered shallow gas-charged sediments. The onshore area is extremely rugged and characterized by extensive glaciation, with many of the ice flows extending to the shoreline.

In Cook Inlet, major hazards also result from seismic activity, mudslides, landslides, and ground movements. There are five volcanoes located in the vicinity of western Cook Inlet, three of which have erupted in the last 21 years causing local damage from ash falls, sea waves, and flooding.

2. Physical Oceanography and Meterology

There are several oceanographic and climatic factors which may influence the type of industrial technology which can be used on the OCS. The climatic factors which are perhaps of greatest concern, are the extreme storm conditions, the wind speed, and the wave height, including tsunami waves generated by earthquakes. Wind speed and wave height calculations are based on a 25-year projection, which is the approximate life of an individual oil field.

In the southern Alaska region, the predicted maximum sustained wind speed equals 90 knots (100 mph) and the extreme wave height equals 30 m (100 ft). An example is the 30-m tidal wave at Dutch Harbor generated by the April 1, 1946 earthquake.

The directions in which currents flow and the winds blow are important partly because they influence the likelihood of an oil slick drifting to shore, where the spilled oil may persist for a long time and lead to major ecological impacts. Swift currents are experienced only in the proximity of bays, such as 6-knot tidal currents in Cook Inlet.

Another oceanographic factor which influences industrial technology is sea ice cover. The southern Alaska region remains ice-free all year except in Cook Inlet, where loose pack ice is present for about one-third of the year. Icing of ships' superstructures due to freezing sea spray is a serious problem in some specific localities, such as Shelikof Strait.

Water depth also influences the type of industrial technology that can be used. The proposed lease areas in the Southern Alaska Region have water depths which range from 30 m to more than 6000 m (4 miles). Cook Inlet and Shelikof Strait waters are less than 300 m deep.

3. Marine Habitats and Resources

a. General Description

The Gulf of Alaska continental shelf is a highly productive area for marine biological resources, particularly the western part of the gulf and the Kodiak area. Primary and secondary productivity on the shelf support abundant populations of shellfish, fin fish, including five species of salmon and rich benthic communities supporting highly valuable commercial stocks of king and tanner crab, halibut, and many other species; generally characterized as bottomfish. This rich resource base supports millions of nesting sea birds, shorebirds, and migratory waterfowl, 23 species of marine mammals including major world populations of steller sealion, harbor seals, and seven species of endangered whales.

b. Habitats and Resources of Special Concern

The Gulf of Alaska, including Prince William Sound, Cook Inlet, and Shelikof Strait supports major groups of finfish and shellfish resources. Five species of Pacific salmon (chinook, coho, pink, chum, and sockeye) spawn in rivers and rear to adulthood in the ocean. King, tanner, and dungeness crab are major shellfish resources of the area, their larval forms generally located in the shallower, nearshore waters for extended periods during development. Shrimp, halibut, sole, flounder, sablefish, pollock, mackerel, and Pacific ocean perch are other important finfish species. Clams and scallops are also important shellfish species; although present commercial effort is very low. Other species present are herring and capelin, which are important as forage species, and various trouts, whitefish, and chars, which are anadromous (along with the salmon), and support sport fisheries.

Seabird colonies including over 6 million nesting birds are present in Southern Alaska with the greatest and largest colonies occurring in the western Gulf of Alaska on the Barren Islands, Semidi Islands, Kodiak Archepelago, Shumagin Islands and in the eastern and central Gulf of Alaska on Forrester Island, and Middleton Island. Major waterfowl and shorebird staging and

nesting areas occur on the Copper River Delta, Yakutat forelands, and Kachemak Bay. Major seabird foraging concentration areas with hundreds of thousands of birds occur on Portlock bank, Albatross banks, east of Kodiak and Afognak Islands.

The most abundant year-round marine mammals in the northern gulf are sea lions, harbor seals, sea otters, Dall's and harbor porpoises, and beluga whales. Fourteen species of whale, 2 porpoise species, and 2 dolphin species occur in the northern gulf. The number of marine mammals either residing in or annually migrating through the region is estimated to be from 90,000 to 100,000.

Major sea lion and harbor seal rookeries are located on Marmot Island, Barren Islands, Tugidak Island, in the western gulf, Cape St. Elias, and Icy Bay in the central and eastern gulf. Major foraging areas for sea lions, seals, dolphins, porpoises, and endangered whales occur on Portlock Bank, Albatross banks in the western gulf, and the Cape Fairweather grounds in the eastern gulf.

The following areas have significant concentrations of marine mammals and are critical habitat for marine wildlife. Coastal areas of Kodiak Island and nearby islands are critical and productive habitat for benthic organisms, such as crab and shrimp, and are important habitat for seals and sea lions. Bays and river deltas from Cape Spencer to Yakutat Bay, such as the Cooper and Bering river deltas, have significant seasonal concentrations are on the Fairweather Grounds in northcentral and the eastern gulf coast and on Portlock Bank northeast of Kodiak Island. The Barren Islands have large concentrations of sea lions. Significant populations of whales including many endangered whale species seasonally occur in the Alaska northern gulf. The distribution of kelp beds, where sea otters generally feed on associated animals, extends from Cook Inlet to Unalaska Island in the Aleutian Chain to the sound. The estuaries of Prince William Sound are very productive areas for many marine species of fish, birds, and mammals.

Soft corals are found extensively throughout the southern regions. They range from southeastern Alaska to the Aleutians.

4. Other Uses of the OCS

a. General Description

There are several additional resources and constraints that will affect both onshore and offshore OCS activities in the Southern Alaska Region. The most important of these resources are the commercial fisheries, but others include transportation considerations, marine sanctuary proposals, onshore land use, cultural resources, and coastal zone management.

b. Uses of Particular Concern

Commercial Fishing: Of the three general areas in Alaska under discussion in this statement, the Gulf of Alaska supports the most diversified and productive commercial fisheries. Commercial efforts on individual species are greater in other areas, but the overall fishery in the gulf is the greatest. Over the last 10 years, Kodiak has always been in the top 10 U.S. fish ports.

Salmon are fished for by U.S. fishermen using seines, set, and drift gillnets; hand and power trollers; and hooks and lines. Most of the fishing occurs within 3 miles of land. In 1979, about 34 million salmon averaging 4 pounds per fish were caught in the Gulf of Alaska. This catch was valued at about 79 million dollars in 1979.

American fishermen use pots for crab and primarily trawls for shrimp although some pot fishing for shrimp is also done. In 1978, about 31 million pounds of king crab, 5 million pounds of tanner crab, 4.6 million pounds of dungeness crab, and 64.4 million pounds of shrimp were

caught and processed from the Gulf of Alaska. Prices ranged from 18 cents per pound for the shrimp, to 43 cents per pound for tanner crab, to $1.21 per pound for king crab, and to 50 cents per pound for dungeness crab.

The foreign (Japan, Russia) trawl-longline for flat and round bottom-dwelling fish species averages about 100,000 mt per year. In 1978, these fish were worth about 8 cents per pound to the fishermen. About 17 million pounds of halibut were caught in 1978 in the Gulf of Alaska by U.S. and Canadian fishermen using longlines. The fishermen were paid $1.28 per pound for halibut. There was no scallop fishing in the gulf in 1978.

The total wholesale value of the Southern Alaska fish and shellfish production is over half a billion dollars per year. This value does not include the 100 thousand metric tons of bottomfish caught by foreigners, which is now potentially an exclusive U.S. resource to harvest.

Transportation: The area fringing the Gulf of Alaska contains the most highly developed water transportation system in Alaska. All major and larger secondary population centers are served by either deep water freight or barge carriers. Deep water ports and ports which show potential for development into deep water facilities are common except on the Bering Sea coast. The most sophisticated and intensely used of the deep water ports is that of Anchorage. Anchorage is the transport hub of the state. Its ports is ice free (except in unusually severe winters) and can accommodate large containerized corgo shipments.

Other deep water ports of note are Valdez (the pipeline terminal), Seward, Kenai, Cordova, Haines, and Skagway. In addition, there are places such as Yakutat and Kodiak which have the natural attributes for a deep water facility, but so far have not acquired the capital for development.

Deep water vessel traffic in the gulf has not reached the density which would warrant the establishment of extensive regulated shipping lanes. Two areas of regulated water lanes, however, do exist. In the southeast portion of the Cook Inlet a voluntary traffic lane for commercial freighters has been established. This action was brought about because of repeated incidents of damage by passing freighters of commercial fishing gear. The second controlled sea traffic area is a required oil tanker lane which extends from Valdez to Dape Hinchinbrook. Beyond the cape the tankers can proceed without any course restrictions.

Marine Sanctuaries: Prince William Sound, the Kodiak Shelf, the lower Cook Inlet have been mentioned as areas that could receive future consideration as marine sanctuaries. These areas are not currently active candidates for designation.

Land Ownership and Use: The major landowner in the region is the federal government, with land in wildlife refuges (Kodiak, Semidi, Simeonof, Tuxedni, and the proposed Becharof, Alaska Peninsula, Iliamna, Kenai, and Copper River NWR's, the Iliamna area, and the Kenai Moose Range addition); in the national park system (Katmai, Aniakchak, Lake Clark, Kenai Fiord, and Wrangell-St. Elias), and in the Chugach National Forest. With the exception of Kodiak, the Kanai Peninsula, the Anchorage area, Cordova, and small communities and Native villages, the coastal area in the region is essentially undeveloped. However, land use ranges from intermittent to intensive, with uses including subsistence hunting and fishing, recreation, rural settlement, commercial fishing, and some agriculture and oil and gas operations.

Cultural Resources: Cultural resources are present resources (historic and archaeologic sites, structures, and objects) on coastal areas of Alaska immediately adjacent to the areas of concern. There is also the probability that archaeologic sites exist on the OCS. Based on a study conducted

for the Alaska OCS Office and site identification recorded in the State Historic Preservation Office, the distribution of approximately 4,000 Holocene-age archaeological sites in relation to Aalska's major ecosystems indicates that a relatively high number of sites occur within the coastal area. The coastal area, therefore, contains significant sites for the study of past cultures.

The probability of archaeologic site occurrence on the OCS has been documented by several studies conducted for the Alaska OCS office. These investigations are based on the widely accepted theory that a worldwide lowering of sea level occurred because of an increase in glaciation during the Pleistocene, which resulted in the exposure of vast areas of the OCS. These exposed lands are believed to have been used by prehistoric cultures during the Pleistocene for subsistence activities and as possible migration routes.

The distribution of known onshore cultural resources is relatively high, particularly in Prince William Sound, Cook Inlet, and on Kodiak Island. Sites of particular interest are located along the coast. Areas of high probability for the occurrence of archaeologic sites have been identified on the OCS adjacent to Kodiak and Afognak Islands and the southside of the Aleutians. OCS areas of probable habitation have been shown in EIS's for Kodiak and Cook Inlet sales. The Gulf of Alaska east of Kayak Island has not been investigated, and such information will not be available in the foreseeable future.

Coastal Zone Management: The State of Alaska's coastal management program (ACMP) received approval from the Department of Commerce in June of 1979. The coastal zone for the State has been mapped, and there are standards for the uses and activities that may or may not occur in the coastal area. Any activity associated with oil and gas exploration, production, and development will have to be consistent with the ACMP.

Local governments in the coastal zone with planning and zoning capabilities are required to prepare their own coastal plans that become part of the ACMP. The plans will provide more specific land and water use guidance for the local area. Once these programs are approved, consistency will also be required.

In the Southern Alaska Region, the Kodiak Island Borough, the Matanuska-Sustina Borough, the Kenai Peninsula Borough, the city and Borough of Juneau, the city and Borough of Sitka, and the cities of Valdez, Cordova, and Yakutat all have local planning efforts in progress. The Municipality of Anchorage, and the city of Haines have approved local plans. All of these will have a major influence on the types of environments in these areas.

5. Coastal Habitats and Resources

a. General Description

The gulf coastal plain is extremely irregular reflecting tectonic and glacial influences with coastal mountain ranges in extensive ice fields. The coastal plain is marked by long beaches and dune ridges backed by high marine terraces. Short meltwater streams and river deltas empty into the gulf. Dynamic interactions of a moist climate, rugged topography, discontinuous permafrost, varied soils, drainage and exposure have resulted in a complex vegetative pattern and varied ecosystems.

The major habitats are as follows: Hemlock-Sitka spruce covering most forested areas: wet tundra areas of low relief dominated by grasses and sedges, with few dwarf shrubs and herbaceous plants; and alpine tundra, open areas above tree line composed of white mountain avens, and low growing herbs, lichens, grasses, and sedges.

Five species of North American Pacific salmon, Dolly Carden char, rainbow and cutthroat trouts, arctic grayling, lake trout, whitefish, and turbot are important freshwater fish found in inland waters.

There are 219 species of birds with 111 of these being seabirds and shorebirds. Approximately 101 species are considered year-round residents in the northern Gulf. Many of the birds that breed and migrate across the gulf coast originate from transpacific or transequatorial regions.

Thirty-three species of terrestrial mammals occur along the northern gulf coast. Both the brown (grizzly) and black bear depend on beach fringe areas and river deltas for feeding. Beaches are important winter ranges for the Sitka blacktail deer. Moose are located throughout the region with major concentrations along the coastal areas. The number of furbearers that have a major dependence on the beach is small, with mink and river otter probably using the intertidal area most frequently.

b. Habitats and Resources of Special Concern

There are three species of birds on the official endangered list that are found on the northern gulf coast: Short-tailed albatross (a seasonal entrant); Aleutian Canada goose (a suspected seasonal entrant); and American peregrine falcon (a suspected resident). There are also four threatened plant species and one threatened mammal subspecies.

The northern gulf coast has extensive and complex estuarine systems such as Prince William Sound, which are highly productive of fish, birds, and marine mammals. Some other important wildlife nesting and breeding areas include the Kenai Peninsula, Lower Cook Inlet, and the Kodiak
and Afognak Island coasts. The coastal areas of the northern gulf support moderate populations of bald eagles and peregrine falcons.

Environmental quality of the northern gulf is good to excellent with air quality presently within air standards for the entire area. Most air quality problems in the gulf coastal area are in Anchorage and Kodiak Island. Seasonal sever dust and carbon monoxide problems exist in Anchorage, and there are solid waste discharges from seafood processors in Kodiak.

Water quality is good, although man-induced stresses, such as domestic sewage, industrial and commercial wastes, forestry waste, and waste or spillage from ships and small boats, are potential problems in developed harbors and settlements.

6. Socioeconomic Factors

The economy of southern Alaska consists of metropolitan Anchorage, and the six census divisions included in the southcentral region. (See Figure A).

Anchorage is the major port, service distribution center for the oil and gas industry, and population center of the state. Anchorage, which has about 43 percent the population and 40 percent of the personal income of the state, has grown rapidly, based on alternating growth in the state's major basic activities: mining (including oil and gas), federal government (including military), fisheries, forestry and tourism.

The most prominent growth industries in Anchorage have been support industries including transportation, communications, public utilities, trade, finance, insurance, real estate, construction services, and state/local government. For a variety of reasons, including continued development of the Prudhoe Bay oilfield and expansion of in-state services, the Anchorage economy has continued to grow during period following completion of the trans-Alaska pipeline. (See Table 1.)

The southcentral region of Alaska, excluding Anchorage, had a 1980 population of around 61,000 and has grown rapidly in recent years. Major basic industries in the region include mining (petroleum) and petrochemical activities, fishing, tourism, and forestry. Employment totals are presented in Table 2.

The fastest growing local economies (census divisions) in the region between 1970-1980 were the Kenai-Cook Inlet (population 22,473) and Valdez–Chitina-Whittier (population 6,042).

The Anchorage and southcentral economies have now adjusted to the end of the TAPS construction, and in 1980 and 1981 the Anchorage economy resumed a slow steady growth. The possibility of rapid growth in the immediate future hinges largely on whether or not the trans-Alaska gas pipeline is built. Over the long-term, continued development of oil and gas, both onshore and offshore, and continued steady growth in tourism and the fishing industry are expected to expand the economies of Anchorage and southcentral Alaska.

Excluding Anchorage, the smaller communities and Native villages in the southern OCS region depend heavely on subsistence fishing. These communities want to retain their relatively low population, close-knot communities, and heritage-laden lifestyles.

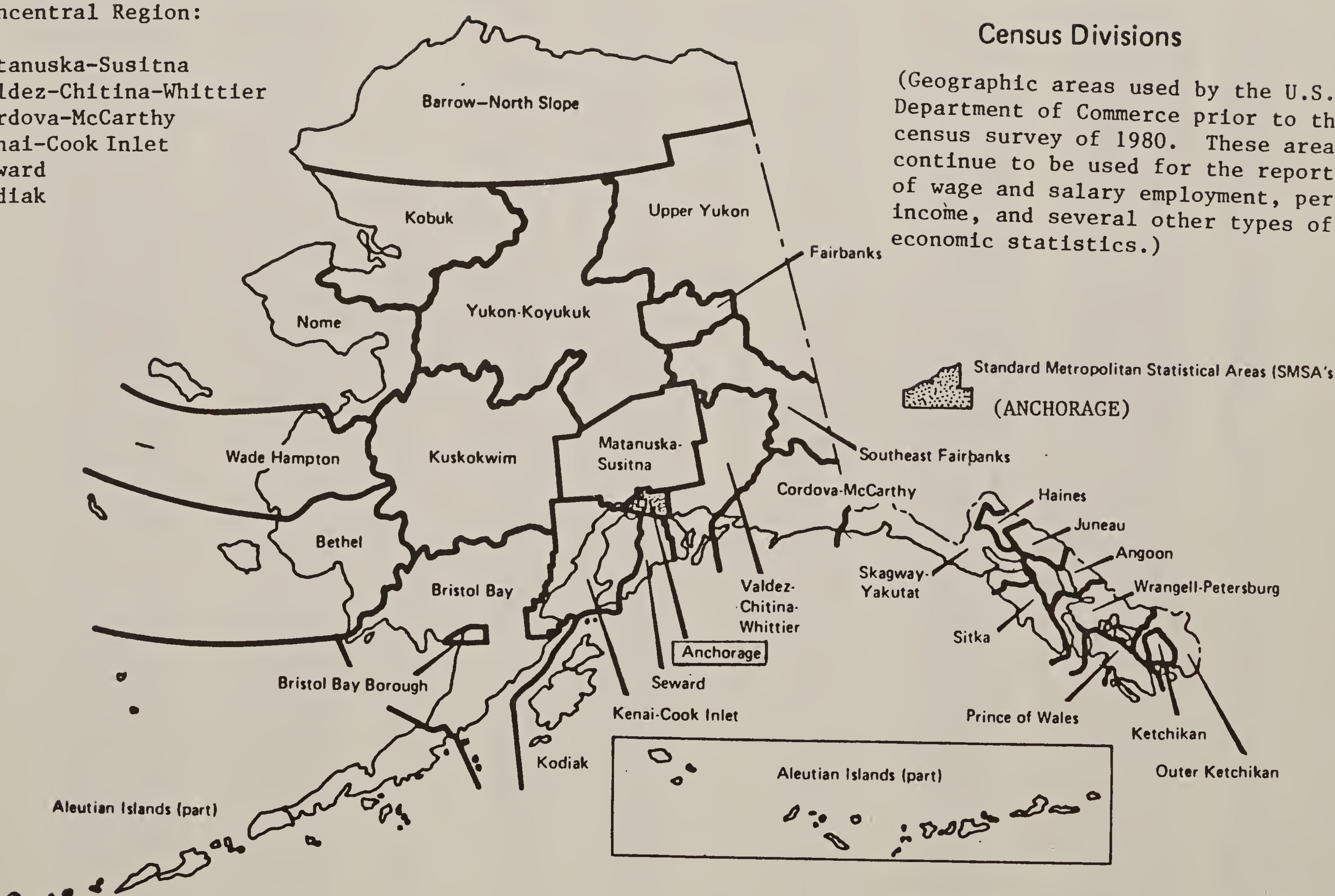
Figure A

Census Divisions Included in the Southcentral Region:

1. Matanuska-Susitna
2. Valdez-Chitina-Whittier
3. Cordova-McCarthy
4. Kenai-Cook Inlet
5. Seward
6. Kodiak

Census Divisions

(Geographic areas used by the U.S. Department of Commerce prior to the census survey of 1980. These areas continue to be used for the reporting of wage and salary employment, personal income, and several other types of economic statistics.)



Source: Alaska Department of Commerce and Economic Development.

Table 1
Wage and Salary Employment, by Industry
Anchorage Census Division

	1975	1976	1977	1978	1979	Percent of 1979 Total
TOTAL WAGE AND SALARY EMPLOYMENT (place of work basis)	81,881	84,818	88,684	88,555	89,206	100.0
Military and Related Civilian Employees	NA	NA	NA	16,369	16,498P	18.5
Military Personnel (active duty only)	12,323	11,799	11,687	11,613	11,704	---
Military-related Federal Civilian Employees	NA	NA	NA	4,756	4,794P	---
Federal Government (except military-related in 1978 and 1979)	10,176	9,813	10,059	5,140	4,964P	5.6
State and Local Government	10,416	10,084	11,101	11,265	12,403	13.9
Mining	1,300	1,409	1,771	1,874	1,983	2.2
Construction	6,913	7,587	7,796	6,431	5,735	6.4
Manufacturing	1,572	1,629	1,687	1,683	1,735	1.9
Transportation-Communication-Utilities	7,343	7,409	7,622	7,924	8,035	9.0
Wholesale Trade	4,076	4,240	4,167	4,197	4,011	4.5
Retail Trade	10,852	11,717	12,410	12,668	13,030	14.6
Finance-Insurance-Real Estate	3,615	4,257	4,748	5,018	4,894	5.5
Services	13,188	14,738	15,336	15,526	15,306	17.2
Miscellaneous	110	136	300	460	612	0.7
WAGE AND SALARY EMPLOYMENT INDEX (number of jobs in 1975 = 1.00)	1.00	1.04	1.08	1.08	1.09	
UNEMPLOYMENT RATE	5.8%	7.0%	7.1%	8.3%	7.5%	

P = Preliminary

Source: Alaska Department of Labor, and the U.S. Bureau of Economic Analysis.

Table 2
Total Wage and Salary Employment in the Southcentral Region
By Census Division

	1975	1976	1977	1978	1979
Southcentral Region Totals..............	19,157	24,049	20,903	19,017	19,859
Cordova-McCarthy Census Division.......	1,010	1,089	1,051	1,110	1,176
Valdez-Chitina-Whittier Census Division	4,763	8,049	4,199	2,043	2,180
Matanuska-Susitna Census Division......	2,026	2,277	2,531	2,961	3,084
Kenai-Cook Inlet Census Division.......	5,595	6,473	7,340	6,565	6,787
Seward Census Division.................	1,250	1,252	1,262	1,328	1,454
Kodiak Census Division.................	4,513	4,909	4,520	5,010	5,178

Sources: Alaska Department of Labor, and the U.S. Bureau of Economic Analysis.

Table 3
Total Wage and Salary Employment in the Fairbanks Region
By Census Division

	1975	1976	1977	1978	1979
Fairbanks Region Totals.................	42,578	42,296	34,821	31,961	31,976
Fairbanks Census Division..........	33,960	33,269	30,224	27,089	26,595
Upper Yukon Census Division........	998	675	491	431	386
Yukon-Koyukuk Census Division......	4,833	4,984	2,437	2,705	2,929
Southeast Fairbanks Census Division	2,787	3,404	1,669	1,736	2,066

Sources: Alaska Department of Labor, and the U.S. Bureau of Economic Analysis.

E. Bering Sea Region

This region includes the St. George Basin, North Aleutic Basin, St. Mathew-Hill, Nararin Basin, and Norton Basin planning areas.

1. Geology

Hydrocarbon Potential and Production History: There have been no lease sales on the OCS in this region. Petroleum prospects in the Bering Sea OCS region include: (1) the thick sections (basins) of Cenozoic and, in some areas, Cretaceous strata underlying broad areas of the Continental Shelf, (2) deformed Mesozoic rocks which underlie manu of these basins, (3) domical and diapiric structures associated with the more deeply submerged (2000 m) umnak Plateau area, and (4) thick masses of late Tertiary beds in summit basins along the crestal region of the Aleutian Ridge. Many of the outer-shelf basins are underlain by folded Cretaceous and Jurassic strata which are not only prospective in themselves, but may have supplied hydrocarbons to overlying Cenozoic structures.

The most promising prospects are the thick accumulations of early Tertiary through Holocene beds that occur in the larger inner-shelf basins which underlie the shelf's major bays and gulfs (Norton).

Geologic Hazards: Potential hazards in the North Alentia. A half region are primarily shallow faulting, seismicity, and volcanism. Other hazards that may present a possible threat to onshore or shallow water facilities are lava flows, mud flows, mad slides, tsunamis, and seiches.

In the St. George and Navarin Basins of the southern Bering OCS, the principal potential hazards are shallow faults, gas-charged sediments, slumping near the shelf edge and dynamic bottom sediments. Seismicity is relatively low. In Norton Sound, potential hazards consist of offshore subsea permafrost, sea ice hazards, gas charged sediments, shallow faulting, and dynamic sediment transport, including ice gouging and sand wave bedforms. Seismicity is usually low (below magnitude 6.5).

2. Physical Oceanography and Meteorology

In the Bering Sea region, the predicted maximum sustained wind speed equals 90 knots (100 mph) and the maximum significant wave height equals about 32 m (105 ft).

The ice cover lasts about half the year and averages 60 to 70 percent of complete coverage during the coldest times. The ice cover is most dense in the northeast part of the Bering Sea, near Norton Sound, and is least dense in the southwest part over the St. George Basin.

The water depths are shallow (30 to 100 m) over the Bristol and Norton Basins, but range down to 3750 m (2.3 miles) over both the St. George and Navarin Basins.

3. Marine Habitats and Resources

General Description: The Bering Sea continental shelf especially the southern portion encompassing Bristol Bay, is the richest and most productive marine and coastal habitat in Alaska. The Bering Sea and its adjacent northern Pacific ocean are areas where the highest values of both primary and secondary biological productivities have been observed in the world oceans. Although warm seas contain more diverse populations, the colder seas, such as the Bering, support larger individual populations. The Bering Sea has the world's largest red salmon run, possibly the largest clam population, one of the largest marine mammal and bird populations and the largest eelgrass beds in the world. Its yelds of national and international fisheries are extremely high.

Habitats and Resources of Special Concern: Many of the species indigenous to the Gulf of Alaska also occur in the Bering Sea. Five species of salmon are present with sockeye by far the most abundant. King and tanner crab, shrimp; and the demersal species such as halibut, sole, pollock, sablefish, Atka mackerel, and Pacific ocean perch are also present.

Scallops are not present, in addition to the trout and Dolly Varden char present in the gùlf, the Bering Sea areas also have inconnu and the arctic char.

Twent-five species of marine mammals are found in the Bering Sea. Important populations of walrus, northern fur seal, stellar sea lion, and sea otter are present in the region. Several different species of seal and eight species of whale occur in the region, with the beluga whale the most common.

Endangered mammals found in the Bering sea are as follows: bowhead whale, fin whale, and humpback whale. The following areas are the critical to specific marine mammals. The aleutian Islands are the most productive sea otter habitat in the works. The Pribilof Islands are the center for thousands of fur seals to mate and raise their young.

The biological heart of the Bering Sea region is undoubtedly Bristol Bay (see Sec. D.%.). The bay is one of the most biologically productive marine areas in the world. Bristol Bay estuary and the associated Continental Shelf possess the greatest concentration of birds, fish, and marine mammals found anywhere on the North American Continent.

4. Other Uses of the OCS

General Description: There are several additional resources and constraints that will affect both onshore and offshore OCS activities in the Bering Sea Region. The most important of these resources is the commercial fisheries, but others include transportation considerations, marine sanctuary proposals, onshore land use, cultural resources, and coastal zone management.

Commercial Fisheries: The Bering Sea is a vast commercial fishing area. The salmon runs in Bristol Bay are legendary. In 1978, the king crab catch in the western Bering Sea near the Aleutian Peninsula made Dutch Harbor/Unalaska the top dollar value center for fish landed in the United States. The salmon catch in 1978 was about 40 million fish. Prices and weights are the same as for the Gulf of Alaska.

In 1978, 102.8 million pounds of king crab, 70.4 million pounds of tanner crab, 18,000 pounds of dungeness crab, and 6.5 million pounds of shrimp were caught in the Bering Sea.

Halibut catches from the Bering Sea area have averaged about 200 mt in previous years. Canadian and U.S. fishermen use the area, however, the bulk of the fish are caught by U.S. fishermen.

The total wholesale value of the Bering Sea fish and shellfish production was over 300 million dollars in 1978. This value does not include the harvest of bottomfish, or groundfish.

National from five other foreign countries have conducted groundfish operations (except halibut) in the Bering Sea. These are Japan, the U.S.S.R., Korea, the Republic of China (Taiwan), and Poland. These nations fish for pollock, Pacific cod, rockfish, sablefish, halibut, flounder, atka mackerel, and others (sole, turbot, etc.) the catch of these species during the 10-year period, 1968-1977, averaged 1.7 million mt.

The groundfish allocations to foreign nations for 1979 is 1.4 million mt, worth about 300 million dollars, all of which is potentially an exclusive U.S. resource to harvest.

Transportation: The Bering Sea is an area of light water traffic. The adjacent coast is without a viable deep water facility. The only deep water port is on the southern side of the Aleutian Islands at Dutch Harbor. Nome, Dillingham, and Kotzebue are the largest towns located on the Bering Sea; they are served by lighter and/or barge vessels. The Bering Sea is ice free and open to commercial water traffic for a period ranging from 6 months in the southern areas to less than 100 days in the far north. During winter, all traffic in this area moves by air. Land connections between the Bering Sea and other regions do not exist.

Marine Sancuaries: Bristol Bay has been nominated for consideration as a marine sanctuary. Currently the area is not an activie candidate for designation.

Land Ownership and Use: The major landowner in the region are the federal government and the Alaska Natives, with federal land in wildlife refuges (Clarence Rhode, Hazen Bay, Aleutian Islands, Cape Newenham, Nunivak, and the proposed Kanuti, Togiak, Yukon Delta, and Alaska Marine Resources NWR's), and Native selections, including St. Lawrence Island, the north and east sides of Norton Sound, scattered sections along the rest of the region's shoreline, and some of the Aleutian Islands.

Almost all of the coastal area in this region is undeveloped, with the exception of small communities and villages. The dominant uses are subsistence oriented.

Cultural Resources: Cultural resources in general are discussed in the section under the Southern Alaska Region.

The distribution of known onshore cultural resources is relatively high, particularly on Nunivak Island and the area surrounding Norton Sound, as well as in the North Aleutian and St. George areas. Areas of high probability for the occurrence of archaeologic sites have been identified on the OCS adjacent to Nunivak, Pribilof, and St. Matthew Islands, St. Lawrence Island, and the Bering Strait.

Coastal Zone Management: Coastal management in Alaska is briefly described in this section of the Southern Alaska Region. Presently, planning efforts underway in the Yukon-Kuskokwim coastal resource service area (CRSA), the Bering Strait CRSA, the Northwest Alaska CRSA, the cities of Nome, Bethel, Dillingham, and Unalaska/Dutch Harbor, and the Bristol Bay Borough. A CRSA including the area surrounding Bristol Bay and the Aleutian Islands is being formed.

5. Coastal Resources and Habitats

General Description: The coastline of the Bering Sea is varied; the north, coast is largely low gravel banks behind pebble beaches with little or nor vegetation. The banks slope upward to Mid-region, the vast Yukon-Kuskokwin Delta is an area of estuarine tidelands and saltwater marshes, with an indefinite boundary. The coast along the Aleutian Islands is generally rocky coastal bluffs.

The major coastal habitats are saltmarshes, lagoons, and river deltas. The region supports a wide diversity of brieflife, mostly in the lowland, marshy areas, and along rocky coastal bluffs. The area is most important for waterfowl, seabirds, and shorebird nesting, and has bald and golden eagles, and peregrine and gyra falcons.

Imporant marine mammals found in the coastal habitats are ringed, bearded, and spotted seal, walrus, and beluga whale.

Habitats and Resources of Special Concern: The continental shelf area of the Bering Sea encompasses one of the largest bird concentrations in the world. The region is a crossroads for waterfowl that use this area exceed several million annually.

The Aleutian Islands are an important ecotome linking Asiatic and North American biotic communities and have members of both continental populations, as well as genetically indigenous seabird species, making the islands of extreme scientific and biological importance.

The Yukon-Koskokwim Delta is one of the most productive waterfowl nesting areas in North America. The Delta has the greatest concentration of nesting geese on the continent and the highest total densities of all waterfowl species (400 nests/km^2) occurring along the vegetated intertidal zone. Over 24 million individuals representing at least 60 species of swans, geese, ducks, and shorebirds utilize the Yukon-Kuskokwim Delta. Izembek Lagoon and Nelson Lagoon along the Northern Aleutian Shelf are two of the most important staging areas for migratory waterfowl and shorebirds. Izembek Lagoon is the full feeding and staging area for the entire world's population of black brandt and contains the most productive eelgrass beds in the world.

Several of the worlds largest concentrations of nesting seabirds occur in the Alaska Bering Sea with over 2 to 7 million on the Pribilof Islands alone, 1 to 8 million on St. Lawrence Island, 1.4 million on St. Matthew/Hall Islands, 1.2 million on Little Diomede, 1.8 million on Buldin Island, and over 15 million total for the Alaska Bering Sea. In addition, millions of nonbreeding seabirds forage along the Bering shelf during the summer. Standing stork is estimated at over 27 million birds.

Twent-five species of marine mammals are found in the Bering Sea. The entire Pacific walrus population overwinters there while nearly the entire worlds population of northern fur seal breeds on the Pribilof Islands. The highest concentration of sea otter occurs along the Aleutian Islands. Major populations of Steller sea lion, harbor, spotted, ribbon, and ringed seal occur in the region. Several nonendangered and endangered cetacean species occur in the regin, with beluga whale and dall porpoise two of the most common species.

Endangered marine mammals commonly found in the Bering Sea region are as follows: bowhead, sie, gray, fin, and humpback whale. Endangered blue and wight whale may also occur in this region. Habitat areas of particular concern for endangered whales and other marine mammals include: Unimak Pass the migratory corridors for the entire Pacific population of gray whales and other cetaceans and fur seals, Bering Strait the migratory corridor for the bowhead whale; walrus, beluga whale, and other marine mammals and migratory birds, Chirikov Basin (outer Norton Basin) primary feeding area for gray whales and millions of seabirds.

6. Socioeconomic Factors

The Bering Sea OCS region can be divided into the Norton Sound portion (population 6,600) with economic activity centered in Nome, the Bristol Bay portion (population 19,500) centered in Bethel, and the Aleutian portion (population 8,300). These three regions of the Bering Sea OCS correspond to Native regional corporation areas–the Bering Straits, the Calista and Bristol Bay, and the Aleut Corporation, respectively.

The economy of the northern Norton Sound area is centered in Nome which is the transportation and commerce center for northwest Alaska. The major employer in Nome is government, with large service, utilities, and trade employment. Nome has scheduled air service, lightering for large vessels, and local truck highways extending into the surrounding area. A substantial skilled/unskilled labor force is available in the Nome area if needed, and the surrounding area includes partially subsistenc villages and the Alaska reindeer industry. Indications are that the area has rich mineral potential.

The two main economic centers in the Bristol Bay area are Bethel and Dillingham. Bethel is the transportation hub for the villages in the Yukon-Kuskokwim Delta. The main employer is government (federal, state, and local), along with transportation and trade. Bethel has scheduled air service and a port with dock and warehouse. No truck and rail service exist. Dillingham is the other major economic center in the Bristol Bay section, and it is the center in the Bristol Bay section, and it is the center for the large Bristol Bay salmon fishery and fish processing industry. Major employment is in fishing, fish processing, government, and trade/transport. The city has regular air and barge service.

The southermost economic area in the Bering OCS region is the Aleutian area. The main economic centers in this area are Unalaska/Dutch Harbor, Adak, and Cold Bay. Cold Bay is an air transportation and communication center, whereas Unalaska is in fishing and fish processing and most labor is transient with little local impact. Unalaska/Kutch Harbor is served by scheduled air and water carriers and its permanent labor force is quite small compared with its seasonal peak labor force.

Another major center of economic activity in the Aleutian area is Adak, a military community with government, construction, and crabbing employment. Adak has scheduled air and water carrier service.

The important regional industrial sectors include government, trade, transportation, services, subsistence and fishing. Subsistence is quite important to residents throughout the region even though there seems a trend toward less dependence on subsistence. Commercial fishing in this area is also very important to the immediate area and the state, since the area is one of the world's richest fishing grounds with considerable growth potential.

The main fish harvested in these western Alaskan waters are salmon, king crab, tanner crab, monopolized the bottomfishing, but the 200 mile limit has set off a rapid expansion of the U.S. bottomfish industry. In 1977, the western area produced better than half the state's shellfish catch, and in 1975, 35 percent of the state salmon catch.

Tourism and animal husbandry are presently quite small, but both have good potential. No petroleum development has occurred on the OCS, but several Native corporations favored continued onshore exploration.

The people of the western region rely on fishing, sea mammals, berries, roots, and birds for subsistence. Summer fishing camps abound, and Bristol Bay is the number one fishing area in dollar value in the United States. The people in this area want to keep their slow-paced, culture-laden lifestyle.

F. Arctic Region

The Arctic Region includes the Hope Basin, Barrow Arck, and Drapir Field planning areas.

1. Geology

Hydrocarbon Potential and Production History: Results of exploratory drilling on State of Alaska leases along the Beaufort Sea coast both in the vicinity of Prudhoe Bay and Point Thompson suggest that recoverable hydrocarbons probably exist in the proposed joint Federal/State lease area. As well, considerable hydrocarbons (mostly gas) have already been discovered in the Canadian Arctic (Melville Island area, Dome Petroleum's Beaufort Sea offshore area, and the MacKenzie Delta region). These arctic discoveries at least offer a reasonable promise of commercial discovery in the U.S. Beaufort Sea.

The northern Chukchi Sea is underlain by some of the same geological features that were found in the oil and gas field at Prudhoe Bay and in several smaller oil and gas fields in and near Naval Petroleum Reserve-Alaska. Sedimentary deposits north of the Barow Arch may well attain thicknesses of 20,000 feet or more. The possibility that they may represent a late Cretaceous and Tertiary delta, combined with the presence of diapiric structures, makes the area attractive for petroleum exploration.

The presence of a regional arch many smaller folds, and numerous faults in the older sedimentary sequence, combined with a local erosional surface at the base of the younger sequence offer good oil and/or gas trapping potential within the Hope Basin.

The Cretaceous rocks beneath the Beaufort Sea probably contain organic-rich shales at their base, as they do onshore. In addition, sands higher in the section contain both oil and gas deposits near the coast onshore. The possibility also exists that some of the pre-Cretaceous rocks which contain oil at Prudhoe Bay may locally extend across the Barrow Arch and underlie the Beaufort shelf. Although tthe Cretaceous and Tertiary rocks are of southern provenance and thicken seaward, the pre-Cretaceous and Tertiary rocks are of southern provenance and thicken seaward, the pre-Cretaceous rocks occur in general within shoreline facies along the Barrow Arch and Thicken southward. Thus, a conservative projection of onshore data suggests that if the prospective pre-Cretacious rocks are present on the Beaufort shelf, they are limited.

Geologic Hazards: The natural hazards of the arctic region are many and severe, and include offshore subsea permafrost, sea ice, ice gouging of the seabed, gas-charged sediments at various depths, coastal erosion, and sediment transport. The Beaufort Sea also has shallow faults, slumping near the shelf edge, and erosion and migration of barrier islands and shoals. The Chukchi Sea also has bottom sediment instability and some shallow faults, although the area is virtually aseismic and offers no volcanic hazards.

2. Physical Oceanography and Meteorology

In the arctic region, the prediced maximum sustained wind speed equals 80 knots (90 mph). Extreme storm waves in the arctic region are not likely to be as high as in the Southern Alaska and Bering Sea Regions, partly because the pack ice reduced the likelihood of their generation, and in any case would reduce their range.

Seasonal ice is present 9 months of the year in the nearshore and is landfast to about 13 meters water depth. The offshore pack ice lasts all year and can unexpectedly be blown inshore even in midsummer. When it is blown inshore, the deep (20 m) ice keels on the bottom of the ice sometimes gouge deeply (5 m) into the sea bottom.

The coastal waters are usually ice-covered for three-covered for three-quarters of the year; the coastal ice cover is solid most of that time. The water depth in the proposed lease areas is less than 75 m.

The summer and winter climate conditions are extremely different–whether measured by ice cover, light level, or temperature. The biological activity is condensed into a brief but very active summer, as is explained in the section on habitats and resources.

3. Marine Habitats and Resources

General Description: Phytoplankton and benthic primary production in the arctic is greatest nearshore within the shallow coastal lagoons. The annual productivity is far less than that of the southern Alaska coastal region, reflecting the short growing season in the Arctic. Greatest production of invertebrates and fish likewise occur in the lagoons, with arctic cod being a key species in the food web.

The environmental quality of the marine arctic region is nearly pristine. There have been no major water pollution incidents in the American Beaufort Sea so predictions of effects are somewhat speculative. Air quality is excellent.

Habitats and Resources of Special Concern: The Beaufort-Chukchi Sea region has the least fish species diversity and population of the three OCS regions in Alaska. Commercial species of crab, shrimp, scallop, herring, and demersal flatfish and roundfish species do not occur in this region. There are small scale commercial fisheries for pink and chum salmon. Inconna, Dolly Varden char, steelhead, and rainbow trout also do not occur. The primary species in the region are whitefish, cisco, grayling, arctic char, arctic cod, flounder and sculpin, all of which support subsistence fishing by local residents.

Although there are many marine mammals occurring in the arctic seasonally, there are relatively few species. The beluga, bowhead, humpback, fin, sei, and gray whales appear during the spring-summer season, and three species of pinnipeds (ringed, bearded, and spotted seals) are also present. The bowhead whale and gray whale are the only endangered marine species found common in the arctic coastal region.

Among the most productive lagoon and river delta habitats that are critical seasonal feeding areas for migratory birds which include Kaseguluk Lagoon, Pearl Bay, Elson Lagoon, Smith Bay, Colville River Delta, Simpson Lagoon, Beaufort Lagoon, and Demarcation Bay.

Soft coral has been trawled in the Chukchi Sea. There is also coral in the boulder areas within the proposed Joint Federal/State Beaufort lease area. This boulder field is a unique habitats similar to a "live bottom" in southern areas.

4. Other Uses of the OCS

General Description: There are several additional resources and constraints that will affect both onshore and offshore OCS activities in the Arctic Region. Other than the hazards previously discussed, these include some commercial fisheries, transportation considerations, marine sanctuary proposals, onshore land use, cultural resources, and coastal zone management.

Commercial Fisheries: This is the least productive commercial marine fishing area in Alaska. In 1978, about 72,000 salmon were harvested around the Kotzebue area. There is also a small, commercial fishery for whitefish and cisco at the mouth of the Colville River. The catch averages about 74,000 pounds annually.

Transportation: More freight is shipped by air than water to the arctic coast. No deep water ports exist along the Arctic Ocean. Cargo ships must anchor far offshore, and lighters are used to bring the freight to land. At Barrow, the largest town of the region, water depth reaches 1 fathom at a point 335 meters from shore. The arctic coast is ice free only during August and September. Freight deliveries are restricted to these months.

Marine Sanctuaries: The Department of Commerce was working on several options for the Beaufort Sea Area. The Beaufort Sea is not currently an active candidate for designation.

Land Use and Ownership: The major landowner in the region is the Federal Government, with about three-fourths of the coastal area in wildlife refuges (Arctic NWR and the proposed Selawik and Alaska Marine Resources NWR) in the national park system, (Cape Krusenstern and Bering Land Bridge) and in the National Petroleum Reserve-Alaska. The state owns most of the land around Prudhoe Bay, and the Natives have selected land at Kaktovik, Barrown, Wainwright, and along the Chukchi Sea. With the exceptionof Barrown, the Deadhorse/Prudhoe Bay/Kuparuk complex, and small Native villages, the coastal area is essentially undeveloped. The dominant uses are subsistence-oriented.

Cultural Resources: Cultural resources in general are described in the seciton under the Southern Alaska Region.

The distribution of onshore cultural resources is relatively high along the Chukchi and Beaufort Sea coasts. The occurrence of sites of greater antiquity is, however, relatively low. The scarcity of Holocene sites is postulated to be caused by persistent beach erosion. Areas of high probability for the occurrence of archaeologic sites have been predicted on the OCS adjacent to Point Barrow and Humphrey Point, if ice gouging and water dynamics have not moved them.

Coastal Zone Management: Coastal management in Alaska is briefly described in this section of the Southern Alaska Region. The North Slope Borough is presently developing a coastal program for the Prudhoe Bay segment of its coastline (the area between the Colville and Canning Rivers.)

5. Coastal REsources and Habitats

General Description: The arctic coast is composed of a series of lagoons and barrier pebble beaches with earth banks behind. The major habitat is tundra of arctic grassland composed of lichens, grasses, sedges, and dwarf woody plants such as cranberry, heath shrub, birch, eillow, and bearberry.

Two distinct seasons are winter with ice and snow cover and little biotic activity, and spring/summer, a short growing seasons of rapid vegetative and fauna growth and reproduction.

The arctic cod is considered a key species in the food web of arctic streams. Other important anadromous fish are ciscoes, whitefish, and char.

There are millions of birds that migrate into the Arctic region. Migratory birds begin to appear in April or May with geese, ducks, cranes, swans, shorebirds, and seabirds being the predominant forms. Their activity ends with fall migration in September.

Mammals such as the arctic lemming and arctic hare are predominant primary consumers. Caribou are of seasonal importance, with moose and muskox of lesser importance. Predominant secondary consumers (predators) are the arctic fox and polar bear. The wolf, wolverine, and brown bear are of seasonal importance during the spring and summer season. The ringed and bearded seals are marine mammals of permanent residency along the coast and on the barrier islands.

Habitats and Resources os Special Concern: The only endangered species reported for the arctic region is the arctic peregrine falcon which is reportedly in the area during migration, but does not breed here since suitable habitat is not available.

Approximately 171 bird species use the Alaskan north coast during the short arctic summer. Fifty of these species can be found along the Beaufort Sea. Offshore areas are used for feeding while estuaries and nearshore uplands are used for reproduction. Estuaries, river deltas, and other drainage areas are also important habitat for other wildlife of the region. Barrier islands are important as denning sites for polar bears.

The environmental quality is very good. The water is nearly pristine and the air quality is about the best in the nation. There are essentially no maninduced environmental stresses such as sewage and industrial wastes, although in the winter, airborne pollutants from northern Europe and industrial areas of North America do drift into the area.

6. Socioeconomic Factors

The arctic region economy is dominated by three activities. First, the non-Native enclave economy is dominated by massive construction and petroleum operations at Prudhoe Bay and Deadhors,e population 5,531. Second, the developed economy dominated by the local and regional government and Native corporation employment, supplemented by petroleum employment, is centered mainly in Barrow. These activities are financed in part by indirect revenues from Prudhoe Bay and Native land distributions. Finally, a Native traditional and subsistence economy supplemented by petroleum and government employment exists in part in the distribution centers at Barrow (population 2,800), in Kotzebue (population 2,500), and in the major part in the smaller villages in the region including Kaktovik (population 136), Nuiqsut (pouulation 161), Wainwright (population 398), and in Point Hope (population 412).

The largest economic activity in the arctic region is the oil and gas activity and its related construction employment. This activity is presently concentrated at Prudhoe Bay on the Beaufort Sea coast where a giant 10-billion barrel, 26-trillion-cubic-feet field is in production. A second area of relatively large exploration activity is the National Petroleum Reserve located to the west of Prudhoe Bay. Finally, light exploration is occurring on Native corporation lands, which extend throughout much of the arctic area.

Typically, oil and gas development is of the enclave type, with small direct effects on the traditional communities. Federal, borough, and local government employment are important in Barrow, with the Prudhoe Bay property taxes financing much of the bourough activity. Local and borough governments are the main activity in the smaller villages outside subsistence. Other major or potential industries of the arctic region are tourism, which is small but growing, and the activities of the NANA and Arctic Slope Regional Corporations, and the other Native corporations with large land and financial holdings and a desire to promote the economic well being of the area.

The people of the arctic region rely heavily on a subsistence lifestyle. Their lifestyle is centered on the bowhead whale–an endangered species–and the focus of current disagreements on quotas. Kotzebue and Barrow receive a substantial number of 1 to 2 day visits by tourists during June, July, and August.

V. ENVIRONMENTAL CONSEQUENCES

A. Generic Impact Producing Factors

1. Oil Spills: The FEIS contains an extensive discussion on the topic of oil spills beginning on page 144. With the exception of the spill frequency estimates associated with the adoption of the proposal, the information in this section of the FEIS remains current. Application of the spill incidence rates used in the Department of the Interior oil spill risk analysis would yield values as shown in Table V.A.1-1. The values in the table represent the anticipated number of oil spills for each of the outer continental shelf regions based upon drilling activities and use of the indicated mode of transportation (P for pipelines and T for tankers). These spills would occur over approximately a thirty-five year period. The expected volumes of oil to be produced and transported in each of the regions (the exposure variables) are included in the table. The values presented in the table represent resource volumes for acreage to be offered according to the proposed five-year schedule. It is assumed that all of the estimated volumes of oil will be produced and transported to shore. There is no accounting in the table for spills originating from existing leases or from oil imports. To put the tabulated expected numbers of spills in perspective; there have been six spills 10,000 and 17 spills 1000 barrels in the United States waters during the production and transportation of 4.3 billion barrels of OCS oil.

2. Water Effluents: Significant onshore and offshore water effluents which could result from OCS oil and gas development are discussed in the FEIS beginning on page 150. No significant change in the information is available. It should be noted that the Environmental Protection Agency (EPA) has responsibility for issuing NPDES permits for discharge of effluents from offshore operations. Onshore water quality impacts due to effluent discharges will be regulated by state water quality boards acting under existing EPA guidelines.

3. Air Quality

a. Regulatory Background

Numerous Federal, State, and local air quality regulations are applicable to Outer Continental Shelf (OCS) oil and gas development. Air emissions from facilities located onshore are regulated by the Environmental Protection Agency (EPA) and State and local agencies. Air emissions from facilities located on the OCS are regulated by the Department of the Interior (DOI). The EPA and DOI rules are based ultimately on the Clean Air Act (CAA), which sets several air quality standards. National ambient air quality standards (NAAQS), designed to protect the public health and welfare, have been set for ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), total suspended particulates (TSP), lead, and nonmethane hydrocarbons. The CAA also set other standards for SO_2 and TSP to ensure that the air quality would not significantly deteriorate in areas with air pollutant concentrations less than the NAAQS. Both the EPA and DOI air quality rules are designed to prevent the NAAQS and prevention of significant deterioration (PDS) standards from being exceeded.

TABLE V.A.1-1. SPILL FREQUENCY ESTIMATES FOR OCS REGIONS
ALTERNATIVE I

OCS Area	Produced Volume Billion Barrels	Trans. Mode	Expected No. of Spills ≥10,000 bbls.	≥1,000 bbls.*
North Atlantic	1.8	P/T	3.2	6.4
Mid-Atlantic	.8	P/T	1.6	3.2
S. Atlantic	.4	T	1.1	1.9
E. Gulf of Mexico	.1	P/T	0.1	0.2
C. Gulf of Mexico	.5	P	0.4	1.4
W. Gulf of Mexico	.1	P	0.2	0.3
S. California	.9	P/T	1.5	3.3
C. & N. California	.5	P/T	1.0	2.0
S. Alaska	.1	P/T	0.2	0.6
N. Aleutian Basin	.3	P/T	0.5	1.2
St. George Basin	.4	P/T	0.8	1.8
Navarin Basin	.6	P/T	1.1	2.6
Norton Basin	.2	P/T	0.4	0.9
Hope Basin	.1	P/T	0.1	0.2
Barrow Arch	.3	P/T	0.5	1.1
Diapir Field	1.7	P	1.3	4.3

*Includes spills ≥ 10,000 barrels.

Onshore emissions are regulated by the EPA and State agencies. Each State is required by the CAA to develop and enforce implementation plans to ensure that areas within the State attain and maintain the NAAQS and PSD standards. Air emissions from any new onshore facility needed for OCS-related activities would be analyzed by the EPA and State agencies. These agencies would determine what type of air pollution control equipment and other control strategies may be needed to ensure that the standards are not exceeded.

Under the Outer Continental Shelf Lands Act Amendments of 1978, the DOI established rules, 30 CFR 250.57, to ensure that air emissions from facilities located on the OCS do not significantly affect the air quality of onshore areas in neighboring states. Air emissions that cause onshore concentrations in excess of the significance levels set by DOI (roughly 2 percent of the NAAQS) are required to be controlled. The U.S. Minerals Management Service analyzes the air emissions from all OCS facilities to determine whether air emission controls are needed and, if so, what type. These rules also ensure that both the NAAQS and PSD standards are not exceeded onshore.

b. Sources of Air Pollutant Emissions

Offshore Sources - Routine Emissions

The air pollutants regulated by the DOI air quality rules are CO, TSP, SO_2, nitrogen oxides (NO_x), and volatile organic compounds (VOC) which contribute to O_3 formation. Although all OCS activities produce all five pollutants, for usual OCS operations NO_x is emitted in the largest amounts, primarily from power generation equipment. If oil production is barged to shore, large amounts of VOC can be emitted by the displacement of hydrocarbon vapors during barge loadings.

Several studies have reviewed emissions from OCS oil and gas facilities. This assessment of impacts is based on the following studies, which contain more specific detail on OCS air emissions:

1. Technical Support to USGS in Preparing Regulations for Implementation of the Air Quality Portion of Public Law 95-372, Radian Corporation, May 1979;

2. Atmospheric Emissions from Offshore Oil and Gas Development and Production, ERCO, for EPA, June 1977;

3. Petroleum Production and Marketing Industry Emission Inventory Documentation, Ventura County (California) Air Pollution Control District (VCAPD), March 1981; and

4. POCS Technical Paper No. 81-7, Air Quality Impact of Proposed OCS Sale No. 68 - Offshore Southern California, Energy Resources Group (ERG), for BLM, 1981.

The studies compiled air emission estimates for various phases of OCS activities.

A summary of representative annual emissions for the major exploration and development activities that occur in the near vicinity of a platform is provided in Table V.A.3-1. In general the values were derived from the maximum values appearing in the studies for the given platform activity.

Power generation equipment, such as gas turbine and diesel engines, is the prime source of emissions during exploration and development activities. As noted in Table V.A.3-1, NO_x is emitted in the largest amount and the platform installation activity will produce the most emissions of any activity.

Table V.D.3-1. Representative Annual Air Emission for Exploration and Development Activities.

Phase	Pollutant Emissions (tons/year)					Notes
	VOC	NO_x	TSP	SO_2	CO	
Exploration Drilling	18	180	13	12	40	Emissions values from VCAPD (1981), assumes 60 days/well, and 6 wells drilled near same site, i.e. constant drilling in same area over the full year.
Platform Installation	16	465	22	31	75	Emission values from ERG (1981), assumes platform installation occurs over 9 months; includes support activities.
Development Drilling	9	240	11	21	71	Emission values from ERG (1981), assumes 2 wells drilled at a time and 12 wells per year.

Supply boats are another emission source during exploration and development activities. The total quantity of emissions generated depends on the distance traveled from the onshore support facility to the platform location. However, a large portion of the emissions from support boats would be dispersed over the entire travel distance and will not be concentrated as the emissions from the platform. Pipeline construction is another variable and nonstationary source of emissions, with total emissions dependent on miles of pipeline laid. For example, VCAPD (1981) estimates 0.7 tons/day of NO_x emissions while laying 1 mile of pipe per day.

Once the platforms, pipelines, and wells are in place, the production phase begins. Major sources of emissions during this phase are turbines and reciprocating engines used for producing and processing oil and gas. Such emissions would occur steadily over the producing life of each field. Emissions will be dependent on production levels, peaking when production is highest. Table V.A.3-2 contains information on power requirements for offshore oil and gas production. These values were used in the planning area specific impact evaluations for air quality.

Table V.D.3-2. Power Requirements and Emission Factors for OCS Production Activities.

ACTIVITY	POWER REQUIREMENT
Oil Production	
Electrical Generation (oil pumping, platform electricity, misc.)	5300 hp-hr/10^3 bbl
Water Injection	3000 hp-hr/10^3 bbl
Gas Production and Processing	
Gas Compression (lift, gathering, sendout)	6100 hp-hr/10^6 ft^3
Offshore Gas Processing (compression for heavy hydrocarbon removal, sweetening, dehydration)	3200 hp-hr/10^6 ft^3

Emission factors (pounds/10^3 hp-hr)

NO_x	CO	HC	SO_2	TSP
2.9	1.1	0.2	0.004	NA

Reference: AP-42, EPA· ERG (1981); ERCO (1977).

If oil production is barged to shore, large amounts of VOC can be emitted by the displacement of hydrocarbon vapor during barge loadings. The quantity and frequency of this emission will vary with the production level and the size of tankers used. ERG (1981) estimated that a 30,000 barrel tanker would emit about 1 ton of VOC over a 6-hour loading period if no emission controls were used. As with support vessels, conbustion emissions from tankers would be dispersed over the entire transit route, and total emissions would depend on the distance traveled. Barging from platforms relatively close to shore could present potential air quality problems.

Offshore Sources - Non-Routine Emissions: Oil spills, fires, and blowouts have the potential for creating short-term air pollution problems. Because most crude oil is composed of at least 75 percent hydrocarbons, oil spills or blowouts unaccompanied by fire can release large quantities of hydrocarbons to the atmosphere. ERG (1981) estimated that during the first hour of a spill hydrocarbons are emitted at the rate of 57 lbs/bbl. During the second hour, the rate declines to approximately 29 lbs/bbl. As an example, a spill of 10,000 barrels would emit 430 tons of hydrocarbons in the first 2 hours. If a well were to blowout with no fire, at the rate of 1,000 mcfd, hydrocarbons would be released at the rate of 2,000 pounds per hour. In the case of a blowout followed by a fire, ERG (1981) estimated that 46 pounds of NO_x, 417 pounds of SO_x, 670 pounds of CO, and 140 pounds of TSP would be produced per hour (based on 1,000 MCFD of gas and 1,000 bpd of oil).

Onshore Sources: Sources of onshore OCS-related emissions include oil refineries, gas processing plants, tanker terminals, and support vessel bases. Refinery and gas processing plants would be the major sources for most pollutants. Harris and Hooper (1979) made an estimate of atmospheric emissions from a "typical representative refinery" (Harris, G. and M. Hooper, Environmental Assessment of Atmospheric Emissions from Petroleum Refineries, in the Proceedings: Symposium on Atmospheric from Petroleum Refineries, EPA, November, 1979). A summary of typical emissions are presented in Table V.A.3-3. Harris and Hooper (1970) note that, because refineries are very diverse, these values represent only a very rough approximation, but nevertheless reflect as much of the "real world" as possible.

Likewise, amounts of emissions from onshore gas processing facilities are dependent on variable items, such as the source of power generation (frequently purchased electricity) and the amount and H_2S content of the processed gas. The New England River Basins Commission investigated emissions from gas processing and treatment plants (NERBC, Factbook, Onshore Facilities Related to Offshore Oil and Gas Development. November, 1976). The study concluded that although emissions depend on plant size and H_2S content, plants without emission controls would emit large amounts of SO_2, VOC, and NO_x and lesser amounts of TSP and CO.

c. Method to Assess Air Quality Impacts

Because of the numerous variables involved and because predictions of items such as number and location of platforms and amount of oil or gas are highly uncertain, it is not practical to make a quantitative assessment of impact. However, a qualitative assessment can be made considering those OCS-related activities that have the potential for causing the most onshore impact. The variables considered in this qualitative assessment are the attainment status of the onshore areas and the major emission sources likely to occur both onshore and offshore. This assessment assumes that no special emission controls have been placed on the sources reviewed. In reality, the EPA and DOI air quality rules would require emission controls to mitigate any adverse impacts that could result from an actual facility.

Attainment Status: Because the NAAQS were designed to protect the public health and welfare, the assessment assumes that a potential impact in a nonattainment area is more adverse than

TABLE V.A.3-3. Summary of Emissions from a "Typical Representative Refinery"

Pollutant	Emissions in g/sec (TPY)		
	Point Sources	Fugitives	Total
Particulates	111.8 (3,886)	0	111.8 (3,886)
SO_x	356.6 (12,397)	0	356.6 (12,397)
CO	23.3 (809)	0	23.3 (809)
NO_x	405.6 (14,100)	0	405.6 (14,100)
Hydrocarbons	27.8 (966)	256.7 (8,924)	294.5 (9,891)

Source: Harris and Hooper, 1979.

an equal impact in an attainment area. More stringent and expensive emission controls and emission offsets would be required for facilities affecting a nonattainment area. As a result, it is more difficult to construct a facility that affects a nonattainment area than an attainment area. The attainment status used in this assessment were obtained from 40 CFR 81, as of July 1, 1981.

Onshore Sources: Refineries and gas processing plants have the most potential to cause adverse impacts. Harris and Hooper (1979) estimated that their "typical representative refinery" would cause a violation of the nonmethane hydrocarbon NAAQS and would likely consume more than 50 percent of the SO_2 and NO_2 NAAQS and nearly 50 percent of the TSP NAAQS. Although actual impact will depend on the exact design and operating characteristics of the facilities, this assessment assumes that new refineries or gas processing plants located as a result of OCS oil or gas development would have an adverse impact, and be of special concern if located in a TSP, SO_2, NO_2 or O_3 nonattainment area. It also assumes that a few plants could be more easily absorbed into the onshore region than numerous plants.

Offshore Sources: Two factors must be considered to determine the onshore impact from offshore sources - amount of emissions and distance of the source from the shore. Distance is important because the atmosphere dilutes pollutants as they travel and resulting pollutant concentrations are higher closer to a source. Because OCS sources are at least three miles offshore, the onshore concentrations from an OCS source will be much less than that from an onshore source. As a measure of whether impact could potentially be adverse, this assessment assumes that any offshore facility located within the distance from shore from which its emissions would not be exempt, as defined by the emissions exemption formula in 30 CFR 250.57, could cause an adverse onshore impact. This exemption formula was derived using conservative meteorological conditions that tend to overestimate onshore concentrations resulting from OCS sources. (See 45 FR 15129,(1980) for additional discussion.)

As noted in the discussion on offshore sources, platform installation, production, and barging, if used, are the activities with the potential to contribute most to onshore concentrations. the values in Table V.A.3-1 are assumed to be representative for exploration and development activities. In reality, exact values will depend on variables such as number and depth of exploratory or development wells drilled and platform size. For the qualitative assessment, the maximum amount of emissions expected from a platform in any year (whether resulting from platform installation or production) is used to determine the offshore distance within which potential adverse onshore impacts could occur from offshore facilities.

For each planning area assessment, the emissions per platform per year were calculated using the conditional mean estimate of oil and gas resources, the expected number of platforms, 30 year life of the field, power requirements and emission factors from Table V.A.3-2 and, if barging is used, assuming 1 ton of VOC per 30,000 barrels of oil produced.

Table V.A.3-4. Qualitative Air Quality Impact.

Onshore Attainment Status	New Refinery/ Gas Processing Facility Needed?	Uncontrolled OCS Contribution Potentially Adverse?	Onshore Impact
Nonattainment	Several	Yes	Very high
Nonattainment	Several	No	High
Nonattainment	1 - 3	Yes/No	Moderate
Nonattainment	None	Yes	Low
Nonattainment	None	No	Very low
Attainment	Several	Yes	High
Attainment	Several	No	Moderate
Attainment	1 - 3	Yes/No	Low
Attainment	None	Yes/No	Very low

The overall qualitative impact is measured using Table V.A.3-4, which also defines the level of expected impact. These definitions are provided in the beginning of Section V.D. Higher impacts are assumed if predominant onshore areas ar nonattainment for the major contributing pollutants, if new large onshore sources (refineries, gas processing plants) are expected, or if OCS platforms are likely to be near shore. Onshore sources will produce more onshore impacts than offshore sources due to their location and because they emit larger amounts of pollutants.

4. Onshore Facilities: The information on sale-induced and nonsale specific onshore facilities presented in the FEIS (beginning on page 155) remains current. The need for sale-induced facilities is provided in the land use section of each planning area impact discussion.

5. Offshore Facilities: The FEIS contains the most current information on offshore facilities used for exploration, development and production (see discussion beginning on page 161 of the FEIS). The discussion on current and projected technology (beginning on page 165 of the FEIS) is also current with one exception. The state-of-the-art in exploratory drilling equipment now makes it possible to drill in 4,800 feet of water.

6. Hydrocarbons and Drilling Fluids on the Marine Environment

a. Petroleum Hydrocarbons

Very little is known concerning the more subtle or synergistic effects on marine organisms which may result from the introduction of hydrocarbons and heavy metals, or increasing levels of these substances into their environment. The following is a summary of Appendix 8 in the FEIS, "Influences of Hydrocarbons and Heavy Metals on Marine Food Webs." References are found in the text and the literature citations of Appendix 8.

Introduction: Hydrocarbons, organic compounds containing only carbon and hydrogen, are universal components of the marine environment. Marine hydrocarbons originate from a variety of sources, including biogenic decay and metabolism, natural seepage of petroleum, petroleum pollution from accidents in transportation, drilling, and production of fossil fuels and atmosphere input coastal wastes, and urban and river runoff. Hydrocarbons can be divided into biogenic (hydrocarbons native to organisms) and petrogenic (hydrocarbons found in fossil fuels). Characteristics distinguishing petroleum hydrocarbons from biogenic hydrocarbons include the following: 1) a much greater range of molecular structures and weights of the more complex mixture of hydrocarbons, 2) approximate unity ratio for even- and odd-numbered homologous series, such as alkanes, 3) more kinds of cycloalkanes and aromatic hydrocarbons, and 4) numerous naphthenoaromatic and sulfonated (e.g., the dibenzothiophenes) hydrocarbons in petroleum that have not been reported in organisms.

Upon entering the organisms, PHC can be either passed through the organism as feces or become incorporated into the body tissues. A significant amount of PHC is taken up and accumulated, at least temporarily, within the body tissues of most fish and invertebrates as a result of an oil spill. Though the relative amount of accumulation varies greatly with the organisms involved and with the concentration and composition of the hydrocarbons, the actual amount accumulated, on a dry weight basis, can be quite substantial.

Hydrocarbons are usually concentrated or stored in association with biogenic lipids. Specific sites of hydrocarbon storage in some marine animals include muscle tissue, gall bladder, brain and other neutral tissues, and liver of fish; gills and digestive gland, or hepatopancreas of shrimp; mantle, digestive tract, adductor muscle, and gonads of scallops and mussels; and muscle tissue and digestive tract of periwinkles, sea urchins, and other intertidal benthos.

Recent investigations have increased the scant information available on the metabolic pathways of hydrocarbon degradation in marine organisms. Degradation of aromatic and paraffinic hydrocarbons has been reported in marine fish and some marine invertebrates. Some phytoplankton and marine invertebrates, including some zooplankton and molluscs, are unable to oxidize either paraffinic or aromatic hydrocarbons. The liver, or the liver-like organ in some invertebrates, the hepatopancreas, is assumed to be the site of hydrocarbon degradation. In these organs, the unaltered hydrocarbons undergo hydroxylation and other detoxification processes. In those invertebrates where degradation does not occur, some of the detoxifying microsomal oxidases in the hepatopancreas may be missing. Resultant metabolic products may be retained in tissues long after the parent hydrocarbons have been depurated and some of these products may be mutagenic, teratogenic, or carcinogenic.

The ability of organisms to depurate accumulated hydrocarbons is a controversial issue. Copepods, barnacle larvae, and other plankton have been found to discharge oil in fecal pellets, passing the oil apparently unchanged into fecal matter. In bivalve molluscs, two forms of hydrocarbon accumulation and release have been reported: 1) a short-term form where PHC are taken up rapidly and depurated completely or to background levels within a range of several weeks to two months and 2) a long-term hydrocarbon burden accumulated in tissues that is not completely depurated. Fish and shrimp, both of which can possibly degrade hydrocarbons, completely depurated accumulated hydrocarbons to background levels, after a short exposure to petroleum.

The avenues of depuration of accumulated hydrocarbons vary. In molluscs and some zooplankton which cannot degrade hydrocarbons, bile salts or some natural detergents are able to emulsify hydrocarbons and allow passage through the gut and into the feces. In fish, the water-soluble hydroxylated products of hydrocarbon metabolism are discharged, probably in the urine, via the gall bladder and kidney. In marine mammals, the metabolites from hydrocarbon degradation are passed through the bile and into the feces and urine. The determined rates of PHC metabolism and depuration are, at present, only speculative.

Uptake, Metabolism, and Discharge: Petroleum hydrocarbons are available to marine organisms in various physical and chemical forms, and the resultant uptake by organisms is dependent on the available form and the degree of the exposure, including the amount and duration. Petroleum form, its initial fluid condition through to its final residual form, undergoes a complex modification, including dispersion by physical forces and chemical modification by oxidative and biological processes. As the petroleum is dispersed and modified, it is presented to pelagic organisms in dissolved, dispersed, or suspended forms, and to benthic organisms in dissolved, dispersed, suspended, or sedimented forms.

Petroleum hydrocarbons (PHC) may enter the food web by two methods. The first involves the active uptake of dissolved or dispersed petroleum, mainly via the gills and possibly through the soft body surface of marine worms. The other methods involves the passage of PHC into the gut from the water column and/or the water surface while drinking or gulping water, and from ingestion of PHC absorbed on particles including living and dead matter. The relative importance of the methods is still largely unknown and probably will vary according to the species, the method of feeding and respiration of the organisms, the type of habitat, the sea state, and the physical and chemical form of the petroleum. Preliminary evidence indicates that the majority of hydrocarbons enter molluscs, crustaceans, and fish via gill membranes. However, recent work with copepods suggests that dietary uptake is the major route and that ingested hydrocarbons are retained longer.

The microbial degradation of fossil hydrocarbons and derivatives in the marine environment has been widely reported. However, the rates vary with the chemical complexity of the crude, the microbial populations, and many of the environmental conditions, such as temperature, oxygen levels, nutrient levels, and microbial predators. The process of "seeding and/or fertilization" of oil spills to facilitate biodegradation has been suggested as a clean-up method, but the possibilities have not been fully explored. A multiseed stock would probably be necessary, and at present, is not technically feasible on open waters or beaches.

Carcinogenicity and Synergistic Effects: Some doubt remains as to the direct carcinogenicity of crude oil and crude oil residues. Polynuclear aromatic (PNA) hydrocarbons, some of which are known carcinogens, such as 3, 4-benzopyrene, phenanthrene, and chrysene, have been reported in petroleum and petroleum products, but concentration levels of PNA from crude oil or concentration levels in the water column after an oil spill are unknown. Benzene, the most abundant aromatic compound in crude oil, has been proven mutagenic to fish eggs. Conclusions regarding the effects of oil and carcinogens in the marine environment are based on limited information. Recent work has implicated crude oil as a carcinogen, but further research is needed in the field of carcinogens and man's exposure to them.

Synergistic effects of oil and other pollutants are not well understood. Immersion studies of seals in oil have shown that nonstressed seals immersed in crude oil exhibited only transient eye problems and minor kidney and possibly liver lesions; no permanent damage was observed. However, seals, stressed by captivity, died within 71 minutes after immersion in oil. PCB's and phenols are known to alter the lipophile metabolizing enzyme system in mammals. It is unclear how genetic factors, sex and size affects this enzyme system. The synergistic interaction of petroleum hydrocarbons with these and other undefined factors may result in severe, adverse effects on marine populations. However, this is an area that needs more research.

Food Web Magnification: The possibility exists of some selective hydrocarbon buildup in the food web, especially by molluscs, which retain a portion of the toxic aromatic hydrocarbons. However, evidence suggests that classical food web magnification (an increasing concentration of hydrocarbons per weight of tissue of lipid at successively high trophic levels) of petroleum hydrocarbons does not occur. The lower trophic levels, including phytoplankton and zooplankton, can accumulate hydrocarbons. The higher trophic levels, such as fish and mammals, have been found to depurate accumulated hydrocarbons. Therefore, food web magnification may more likely be a function of the ability of different species to accumulate and depurate hydrocarbons from the water and food rather than a function of their position in the food web. Food web magnification may occur in birds since chlorinated hydrocarbon pesticides have been found to accumulate in birds on land. This accumulation of petroleum hydrocarbons could pose a threat to bird populations.

Public Health Effects: Crude oil and crude oil residues have been implicated as possible carcinogens. Oil contamination could pose problems to human health if contaminated seafood were consumed. According to the National Academy of Sciences (NAS, 1975) workshop on petroleum in the marine environment, tentative conclusions are:

> Although our information is limited, the effect of oil contamination on human health appears not to be a cause for alarm. From our calculations, we estimate that the carcinogen benzopyrene concentration on a dry weight basis arising from a high level of contamination by petroleum is comparable with that of common terrestrial

foods. We, of course, do not recommend eating contaminated seafood, but in most cases, because of the taste factor, not many will be tempted to do so. It is clear that this is an area in which our knowledge is grossly inadequate and that the contamination of seafood by oil is clearly undesirable.

However, recent work by Yevich and Barszcz (1977) has further implicated petroleum as a carcinogen. During two oil spills involving a No. 2 fuel oil and a No. 5 diesel oil, they found two types of cancer formed in soft shell clams. One type forms in gonadal tissue and quickly spreads to other organs; while the other is a blood cell form equivalent to leukemia. Additional research is needed on this subject to evaluate the potential risk to the marine and human environment.

b. Heavy Metals and Drilling Fluids

Heavy metals occur naturally in seawater in relative low concentrations. In the coastal zone, especially in estuaries, near river mouths or municipal discharges, concentrations may be much greater than natural background levels. Fourteen trace metals are known to be essential for animal life, serving as components of enzymes, enzyme systems, activators, components of vitamins, hormones and respiratory pigments.

In offshore operations, petroleum, formation waters and drilling muds may contribute heavy metals and other trace elements. Concentrations in crude oil vary greatly. Nickel and vanadium are generally the most abundant metallic elements in crude oil, although cobalt, mercury, iron, and zinc can be abundant. Nickel and vanadium are known to occur in several colloidal materials covering broad molecular-weight and polarity ranges.

Drilling muds contain barite (barium sulfate) and ferrochrome lignosulfonate. Though chromium is known to be toxic in certain elemental states, when bound in chemical compounds, it is less toxic. It has been shown that in ferrochrome lignosulfonate, the chromium is firmly chelated and is not likely to be removed from the complex even by strong exchange resins.

The International Decade of Oceanographic Exploration Workshop concluded that with the possible exception of lead, current levels of heavy metals in marine ecosystems are derived primarily from natural sources. (Natural sources include river water, windblown material from weathered rock and tectonically active ridges where heavy metals are emitted in heavy brine.) In a Gulf of Mexico production area study, the Gulf Universities Research Consortium concluded that all heavy metals observed in the water column were within ranges reported for oceanic waters, with the possible exception of barium. Similarly, no evidence of bioaccumulation has been reported in the Buccaneer Oil Field study (EPA/NOAA) or the Central Gulf of Mexico platform monitoring study (BLM). Once in the marine environment, concentrations of heavy metals are lowered by dilution and removed from seawater by precipitation, absorption, and adsorption. Accumulation in marine organisms can occur by uptake and adsorption from seawater through gills, body surface, or gut wall. The amount adsorbed depends on many physical characteristics, as well as biological characteristics of the organism. Accumulation can also occur through ingestion of food containing heavy metals. Food sources for accumulation of heavy metals include those adsorbed onto suspended particles or plankton, heavy metal compounds that have precipitated into sediments and been ingested by deposit feeders, and heavy metals concentrated by organisms, which are then preyed upon by other organisms in higher levels of the food chain.

Concentration factors in marine organisms (measured against that available directly from the organism's environment) range up to more than one million for the heavy metals.

The relative importance of uptake from water compared to uptake from food is still being studied and is by no means resolved for marine organisms. It probably varies because of factors mentioned above for different elements and organisms as well as various relative concentrations.

Heavy metals are usually used in enzyme systems or stored in a particular body tissue, sometimes only temporarily. The storage location depends on the type of metal, form of the metal complex, method of uptake, species of organism and other factors. Storage sites for most organisms include digestive glands, muscle tissues, skeletal tissue and gills. Most metals of concern from the standpoint of possible contributions from oil and gas operations are a part of the biological catalyst system and include iron, copper, zinc, manganese, and cobalt (nickel, chromium, cadmium, and silver may follow these elements).

There have been few studies to date on the release or depuration of heavy metals from marine organisms to the marine environment. Although data on retention times are scanty, there are indications that metals concentrated in animal tissues are retained as significant concentrations from several days to several months. Discharge of heavy metals from marine organisms can take place by ion-exchange across cell membranes of gill and body surfaces, loss of molting exoskeletons that have concentrated heavy metals, excretion of heavy metals into the gut, and loss by feces and excretion in the urine. All of these processes help an organism to regulate the concentration of heavy metals and other substances accumulated from seawater or food, but the extent and rate of their release is poorly known for heavy metals.

Many variables are involved in the uptake, storage, metabolism, and release of heavy metals, and very little is known of their transport through the marine ecosystem.

There is ample evidence to indicate that heavy metals accumulate in the marine food web in a variety of organisms at various trophic levels and through a variety of paths of uptake. Most of the characteristics of heavy metals in the marine environment favor their magnification in the food web. They are relatively resistent to chemical and biological degradation. However, classical food web magnification is complicated, not only by the various uptake methods, but by the ability of some organisms to release heavy metals back to the marine environment.

There is evidence that heavy metal concentration in petroleum, formation waters, and drilling fluids can range from 10 to 10^5 times the natural background levels of the open ocean. Therefore, events such as accidental massive or chronic oil spills, accidental loss of drilling fluids and the discharge of formation waters can introduce higher loads of heavy metals into the ocean. The introduced metals are then diluted by seawater, precipitated out, adsorbed on particles or other organisms and absorbed by some marine organisms, occurring around drilling platforms for the most part.

Therefore, there could be some uptake of metals, especially by the sessile organisms around the platforms. It is not known to what extent this occurs and to what levels the heavy metals would concentrate in the water column, sediments or marine organisms as a result of petroleum operations. Investigations of the uptake of oil-associated trace metals in experimentally oiled sediments suggested that the detritovores *Phascolosoma agassizii* and *Macoma inquinata* were not exhibiting uptake of trace metals from the oiled substrate. Early investigations conducted concerning effects of heavy metals from offshore petroleum operations indicated that concentrations of heavy metals in the water column were within the ranges for the metals in the ocean water, except for barium where the data were inconclusive, and a zinc gradient around the platform probably due to the decomposition of the sacrificial covering of the platform legs. Recent work

in the Buccaneer Oil Field has indicated significantly higher concentrations of barium, lead, and zinc in the surficial sediments within 180 m of two of the platforms studied relative to the average trace metal concentrations recorded in the BLM baseline study. BLM rig monitoring studies in the Gulf of Mexico have also reported elevated levels of cadmium in addition to barium, lead, and zinc in benthic sediments near drilling sites.

The fate and effects of drilling fluids and trace metal components has been the subject of increased research in the last few year. Most efforts have dealt with dilution, dispersion, and transport of mud contaminants. The available literature demonstrates that continuous low level discharges of drilling fluids (10-20 bbl/hr) will dilute by factors of 10^4 or 10^5 within 200-300 m of the discharge source. Background concentrations for suspended solids are generally reached within 300-1,000 m of the source.

The majority of experimental effects data in the published literature at this time indicates that whole muds and mud components, with the exception of bactericides, are relatively nontoxic. The use of chlorinated hydrocarbons in bactericides has been banned by USGS. LD50's for whole muds have been reported in the range of 10,000 to greater than 100,000 ppm. The work to date indicates that adult cold water organisms are generally not more sensitive than temperate ones.

Petrazuollo (1981) has reviewed the literature on fates and effects of drilling muds and performed an environmental hazard assessment in support of EPS's issuance of a general discharge permit for oil and gas drilling rigs in the Gulf of Mexico excluding the Flower Garden Banks. The conclusion was that "no unreasonable amount of impact would occur for the period (two years) covered by these permits."

Dames and Moore (1981) analyzed the available information and applied results to scenarios for the Georges Bank and Cook Inlet. While recognizing the possibility of a potential for rig-associated fish to bioaccumulated trace metals, the report indicated the likelihood of significant impacts on pelagic plankton and nekton from drilling muds and cuttings is remote. The report also concluded that significant benthic effects are unlikely beyond 3 km down current from the discharge site.

In a recent application of the adaptive environmental assessment process developed by Hollings (1978) to the effects of drilling muds discharged in the marine environment, water column effects in the open ocean were found to be negligible.

Benthic effects were less easily evaluated although effects of discharge near nondepositional environments were generally considered to be minimal.

B. Impacts of the Physical Environment on Offshore Operations

Constraints to OCS oil and gas development activities considered in the following sections are geologic, oceanographic, and meteorological.

Meteorological conditions may severely impact OCS development. Fog, rapid weather changes, severe winter storms, hurricanes, and extratropical and tropical cyclones with attendant high sea state, strong winds and storm currents frequent portions of the OCS. Freezing and thawing of offshore subsea permafrost, the presence of land fast, shear and pack ice, and icing on ship and platform superstructures can cause engineering problems for OCS activities in northern areas.

Oceanographic parameters which may impact OCS operations include extreme wave heights, water depth exceeding the present extent of proven oil production technology, high velocity surface and subsurface currents, and extreme winds.

Instability of the seafloor, whether from seismic activity or sedimentary processes, is a major geologic hazard to emplacement of platforms and pipelines in the marine environment. Hazards related directly to seismic activity include ground shaking, fault rupture, generation of tsunamis and earthquake-induced ground failures such as liquefaction and slumping. Faults showing displacement of either the seafloor or young (less than 11,000 years) sediments as well as those associated with historical earthquakes are considered active, and therefore, potentially hazardous to development. Instability of the seafloor can also result from dynamic (e.g., wave surge) and static (e.g., gravity) forces acting independently of seismic activity. Some areas of the seafloor are prone to mass movement (e.g., slumps and slides) or other forms of sediment transport (flows, creep, or current scour). Sandwave migration may be prevalent in shallower waters resulting in scouring, differential loading on structures, and exposure of buried pipelines.

Gas-charged sediments, high pressure gas zones, and gas saturated sediments are significant potential hazards. The presence of high pressure gas is not an uncommon cause of blowouts during drilling, and if gas is present above saturation (bubble phase), it reduces the expected depth-dependency increase in sediment shear strengths.

Volcanic eruptions may create locally hazardous conditions in the form of lava and ash flows, fire, toxic gases, corrosive rains, flash floods, and local tsunamis.

Hazards, as discussed above, pose a danger to pipelines (onshore and offshore), platforms, refineries, and other oil and gas development support facilities.

Many of the dynamic processes noted involve forces so great that the only means of limiting damage to man-made structures is to avoid areas with extreme geologic, meteorologic, or oceanographic conditions. Detailed maps derived from site-specific high resolution seismic surveys can be used to identify areas of potential instability (e.g., faults, slumps and slides) as well as apparent geopressured zones. Adjacent well control is also used to detect shallow gas zones to be avoided.

Alternatively, structures may be designed to accommodate expected conditions. Building criteria will establish the necessary guidelines to erect structures capable of withstanding maximum ground accelerations from earthquakes, forces related to wave and wind impact, and other dynamic processes. These criteria will be established within a Platform Vertification Program administered by USGS. "The design, fabrication and installation of all new fixed or bottom founded platforms or other structures shall be designed, fabricated and installed in accordance with the applicable provisions of the document, "Requirements for verifying the structural integrity of OCS platforms" (see *Federal Register* Vol. 44, No. 128, July 1979)."

Drilling structures will be engineered for a maximum force times a safety factor. Structures can be made more sturdy in unstable areas by increasing piling thickness, reducing the area of drag by drilling through the platform legs, and increasing the depth of pilings in soft bottoms. In areas of current scour, the base of structures and pipelines will need to be shielded to prevent damage. Surface casing may be set at shallower depths in regions of shallow faulting.

There are a sampling of the types of problems and mitigating measures which may be considered in the Platform Verification Program. Each structure or pipeline will need to be considered on a case-by-case basis to adequately assess the potential hazard and the appropriate solution particular to each situation.

North Atlantic: The principal environmental conditions contributing to constraints on engineering of structures and conduct of operations in the North Atlantic region are severe weather and high seas coupled to the relative shallowness of Georges Bank and the abundant mobile sediments on the surface of the shelf area.

Hurricane and tropical storm conditions will generate high winds and excessive wave heights. Mean bottom current flows range from 5-30 cm/s, sufficient to erode North Atlantic shelf sediments, thus exposing structures to the risks of sediment scouring.

The surficial sediments of Georges Bank are in almost constant motion under average tidal currents and wave conditions. Sediment scour is likely at the base of any structure or pipeline placed on the seafloor. These will have to be properly shielded to prevent damage. Large areas of active sand waves are present. The sand waves, ranging 10-20 m high and hundreds of meters long, are predominant in waters shallower than 60 m. Scouring, differential loading on structures, and exposure of buried pipelines could result from sand wave migration.

Shelf-edge (about 200 m depth) and upper continental slope mass sediment movement and/or slope foundation instability is probable. Creeping, slumping, or weak sediments may exist to sediment depths of a few hundred meters and initiation of sediment motion may be related to oceanographic conditions. Proper site selection and structural design will be required.

Foundation instability on the shelf area will be influenced by the presence of buried channels, shallow lenses of low strength sediments, and by gas-charged shallow sediments. Sand waves located to the southwest of Georges Bank are not believed to be active or pose threats to operations. Likewise, shallow recent faulting is not seen as a major concern. To date, the location of exploratory operations in the region has relied upon avoidance of potentially hazardous sites, following geophysical and geotechnical examinations.

While the primary leasing sites will be located on Georges Bank and the continental slope in the Baltimore Canyon areas, exploration potential for the near future may extend to water depths of 2,000 m, encompassing a broad zone beyond the shelfbreak. Little is known about bottom conditions, as related to engineering considerations, at such depths.

In conclusion, the capacity to withstand severe wind and wave conditions accompanying extratropical cyclones and hurricanes needs to be considered in the design and construction of offshore structures. Slumps and offshore gas charged sediments also represent potential engineering constraints in the region.

South Atlantic: Excessive water depths, high speed winds and large waves generated by tropical storms, sediment scour and instability and high velocity surface and subsurface currents are principal engineering constraints on OCS development in the South Atlantic.

The major meteorological condition likely to impact operations in the South Atlantic area is the tropical cyclone (including tropical storms, tropical depressions and hurricanes).

The major impact-causing oceanographic condition results also from hurricanes in the form of waves. Besides the physical damage caused by wave impact, wave energy acting on the bottom sediments underneath and around a bottom-supported structure may result in scour and/or sediment instability, which in turn can result in partial or total failure of the structure.

Gulf stream currents (which may reach speeds of 180 cm/s) in combination with deep water represent potential constraints on the oil industry efforts off the South Atlantic coast. The industry, however, has recently drilled off the South American coast in deep water and had to contend with up to three knots of currents. With special engineering, the well was successfully drilled.

Numerous faults have been recognized on the Florida-Hatteras shelf, the adjacent continental slope, and within the inner Blake Plateau. Most of the faults are believed to be related to compaction although five slump faults have been located on the slope. The faults appear to be buried and inactive at the present time. No active sand waves or slump masses have located on the shelf or slope.

In conclusion, the high probability of damage related to storm generated winds and waves, as well as sediment scour and instability in the South Atlantic, necessitates detailed sediment engineering surveys and the design of a structure capable of withstanding a 100-year storm in the area.

The presence of excessive water depths over much of the South Atlantic coupled with velocity currents will require expanding the limits of oil production and exploration technology through special equipment and procedures.

Gulf of Mexico: Winds and waves generated by tropical cyclones, high velocity surface and subsurface currents, faulting, sediment scour and instability, and high pressure gas zones are the principal engineering constraints to OCS development in the Gulf of Mexico.

The major meteorological condition likely to impact operations in the Gulf of Mexico is the tropical cyclone (including tropical storms, tropical depressions and hurricanes). The probability of damage resulting from a tropical cyclone is high.

The major impact-causing oceanographic condition results also from hurricanes in the form of wind and waves. Besides the physical damage caused by wave impact, wave energy acting on the bottom sediments underneath and around a bottom-supported structure may result in scour and/or sediment instability, which in turn can result in partial or total failure of the structure.

Two dynamic geologic conditions prevail which may be hazardous to petroleum exploration and development: (1) salt movement resulting in domes, faults, steep slopes, gas seepage, and sediment slumping; and (2) rapid sedimentation in deltaic areas that result in under-consolidated fine-grained, often gas-charged sediments which can flow and slump on very low slope gradients.

These conditions occur most frequently around the Mississippi Delta, the OCS, the upper continental slope, and the ancient Rio Grande Delta off south Texas.

Karst topography is found in portions of the eastern Gulf and may pose operational problems.

Of lesser importance in the Gulf of Mexico is the risk from earthquakes. No known damage has been recorded from earthquakes to an offshore oil platform or installation in the Gulf of Mexico.

Active faults, gas seep areas, and seep mounds pose dangers to offshore seabottom operations. These hazards are detectable by geophysical surveys and can be avoided.

Hydrogen sulfide gas has been a problem on shore in the Mississippi-Alabama-Florida area and may be expected to be hazardous to those people working on the drilling rigs offshore.

Although numerous hazards from the physical environment impact OCS activities in the Gulf, over 30 years of exploration and development experience has resulted in a technical expertise capable of mitigating most of the difficulties. The presence of over 2,600 successfully operating offshore structures in the area attests to this.

Pacific Coast: Platforms, pipelines, and other oil and gas development related structures are designed to withstand lateral and vertical forces associated with geological, meteorological, and oceanographic phenomena.

The principal impacting environmental condition in the Pacific OCS is ground motion related to seismic activity and sediment instabilities (e.g., slumps and slides). In designing a structure capable of withstanding the forces attendant to those geologic impacts, any possible impacts from meteorologic and oceanographic conditions are more than compensated for (e.g., structures are normally designed to withstand a 100-year storm; in designing a structure to accommodate seismic activity in the Pacific OCS, a structural design capable of withstanding a 400-year storm is often created).

To determine the level of expected seismic activity in a given area, probabilistic ground accelerations are computed based on predicted magnitude of a seismic event, distance of site from fault, and possible attenuation or magnification of a seismic wave by sedimentation conditions at the site.

Sediment instability analysis is also conducted. This is accomplished primarily by identification of historic mass movement either into or from the site in question. In addition, the physical characteristics of sediments are studied to determine a liquefaction potential.

With respect to platform construction, stability is primarily a function of piling diameter and depth of penetration into the substrate. Design criteria can generally be established which effectively mitigate the impact from ground motion or sediment instability. However, the engineering necessary to maintain the structural integrity of an offshore structure may be prohibitive to development and necessitate an alteration of the proposed site selection.

In general, the principal means of mitigating hazards to pipelines due to geological phenomena is to choose a pipeline route free from topographic irregularities, active faulting, and/or areas of sediment instability. Pipeline burial offshore to a water depth of 70 m (200 feet) (or some other anchoring method) is required by DOT regulations (see Code of Federal Regulations, Part 195.246). This provides protection against damage caused by strong currents nearshore. In addition, the pipeline is generally weight-coated with concrete to ensure stability under 100-year storm conditions and to provide negative or neutral bouyancy as a protection against "floatout." Depending on depth and differential pressure changes, increased pipewall thickness is used offshore to provide additional weight and adequate collapse resistance.

In areas of active faulting, one technique to limit damage due to ground motion is to keep the pipeline as flexible as possible in order to accommodate shifts in the seafloor.

Arctic Region: Ice will have the most significant impact on offshore oil and gas operations in the Beaufort and Chukchi Seas. Four major ice classifications will influence the type of technology that will be used in developing the oil and gas resources of the region. They will determine the development schedule, siting requirements for offshore facilities, and the need for new technology to operate in the more mobile ice zones.

The most stable ice conditions will be in the bottomfast zone which is restricted to depth less than two meters. Usually, ice motion in the zone is negligible and reasonably safe. Seaward of this zone the hazards become more severe and present more difficult problems to oil and gas operations. Shorefast ice will form out to water depths of approximately 15 meters. Ice movement within this zone can reach several hundred meters. Industry has proved they can operate within the bottomfast and shorefast ice zones. Seaward of the shorefast ice zone large grounded ice pile-ups form an ice ridging zone. Beyond the ridging, the highly mobile pack ice dominates the arctic regions. Ice in this zone can undergo movements greater than a kilometer and can occur at any time during the year. Massive grounded ice ridges are common. In addition, the seafloor within this zone is severely scoured by pressure ridge keels and ice island fragments.

In the Chukchi Sea the combination of severe ice conditions and water depths will be a concern to offshore operations.

A detailed discussion of the above mentioned hazards can be found in the 1979 Beaufort Sea FEIS and in the 1980 Diapir Field DEIS.

In conclusion, the design of offshore structures must take into consideration the potential forces associated with a variety of ice types; drilling programs will have to take into consideration the presence of permafrost and gas hydrates; new and improved technology must be developed as oil and gas operations move into the zones of grounded ice ridges and pack ice; and bottom disturbance by ice ridge keels and ice island fragments must be taken into consideration in the design and siting of pipeline routes.

Bering Sea Region: The Bering Sea region is characterized by a variety of potential onshore and offshore natural hazards and constraints. In the Bristol Bay region seismicity, shallow faulting, and local sediment instability are the primary concern to offshore operations. In the St. George and Navarin Basins, the principal potential hazards and constraints are sea ice, shallow faults, gas-charged sediments, water depths, and unstable sediments on the continental slope and canyon walls. In the Norton Sound, the offshore hazards consists of sea ice, gas-charged sediments, shallow faulting, sediment instability, and dynamic sediment transport. In addition, climatic factors, such as storm waves and high winds, can be severe throughout the entire region. Major concerns to onshore and nearshore facilities on the Aleutian Chain include the probable occurrence of large magnitude earthquakes, mudslides, landslides, volcanism, tsunamis, seiches, seafloor displacements, and mass sediment movements. A more detailed discussion of these hazards and constraints can be found in BLM EIS's for OCS Sales 57 and 70.

These hazards will have an impact on the selection of present day technology to develop any oil and gas resources within the Bering Sea region, on the exploratory and development schedule, on siting requirements for offshore platforms, pipelines and onshore-related facilities, and on the development of new and improved technology that will be needed to handle the problems associated with sea ice, the deeper water depths, and severe climatic conditions.

In conclusion, offshore structures must be designed to withstand the forces of sea ice and severe climatic conditions of the area; offshore site selection, drilling programs, and the selection of pipeline routes will have to take into consideration many of the bottom and subbottom hazards discussed above; the potentially destructive force of earthquakes and related hazards will have a tremendous influence on the design and siting of onshore and nearshore facilities; and the combined forces of sea ice, severe storm conditions, and greater water depths (over 500 m) could surface the need for new and improved technology, especially for the production and development phase.

Southern Alaska Region: The physical environment of the Southern Alaska region will impose a great number of hazards and constraints upon the oil and gas operations onshore and offshore. Since this region is the site of one of the most active seismic zones in the world, the probable occurrence of a large magnitude earthquake and its associated hazards is high. Earthquake generated offshore hazards include mass sediment movement, faulting, and displacement of the seafloor. Onshore and nearshore hazards include ground acceleration, mudslides, landslides, tsunamis, and seiches. In addition, other geologic hazards that will be a concern to oil and gas operations are gas-charged sediments, volcanism, dynamic bedforms, and buried channels.

The oceanographic and climatic factors that will be a major concern to offshore operations are the extreme storm conditions, wind speeds, wave heights, and water depths exceeding 500 meters. The Southern Alaska region remains ice free all year except in Cook Inlet, where loose pack ice is present in the winter.

A detailed discussion of the above mentioned hazards and constraints can be found in BLM EIS's for OCS Sales 39, 55, and 60.

The above mentioned hazards and constraints will influence the type of technology used, the production and development time frames, the siting requirements for offshore and onshore facilities, and the need to develop areas where the combined environmental conditions are beyond capabilities of today's technology.

In conclusion, offshore structures must be designed to withstand the potential impacts of large magnitude earthquakes, associated hazards, and the severe climatic conditions of the area; offshore site selections, drilling programs, and the selection of pipeline routes will have to take into consideration many of the bottom and subbottom hazards discussed above; the potential of large magnitude earthquakes and associated hazards will influence the design and siting of onshore and nearshore facilities; and the extreme storm conditions of this region and water depths exceeding 500 m will require the development of new and improved technology for offshore production and development.

C. Impacts of Adopting the Proposed Leasing System and Planning Areas, and Boundary Changes Thereto

The adoption of the proposed schedule carried with it two significant changes from present procedures. First, the entire leasing process will be "streamlined" (see Section II), and second, entire planning areas on the OCS will be offered at each sale. These changes are closely linked to the adoption of this alternative as the time between sales in some areas would be too short to accommodate the current leasing process.

The streamlining of the OCS leasing process will result in numerous administrative changes (see Section II). Some of those changes will call for considerable modifications in the way industry relates to government in determining areas for inclusion in sales (broad areas will be identified instead of specific tracts); a large portion of the modeling and EIS preparation effort will now precede the initiation of the formal preleasing process; industry, states, local governments, and public interest groups may be required to respond more quickly to requests for information or review; and more emphasis will be placed on post-sale hazards evaluation, comment and monitoring. The impacts of the proposed changes are discussed below.

1. Call for Information

Rather than ask for tract specific data and the nomination of individual tracts, industry, other federal agencies, state and local governments, special interest groups, and the general public will be asked to provide information concerning a proposed sale in a planning area. General and specific information about the area as well as recommendations for leasing areas and areas to be deleted from leasing consideration will be accumulated in this manner. Areas, rather than specific tracts, will then be proposed for a sale offering. Some detail will necessarily be lost in this system since it will no longer be possible to devote an intensive staff effort to a relatively small number tracts. If area-wide offerings are adopted, tract specific analysis will no longer be possible (up to 5,000 tracts could come under consideration in one sale proposal). Thus, some specificity of analysis will be lost in the early stages of the process. A more general knowledge of the planning area–a more regional approach–will be required. Based on available information, reconnaissance studies, and previous experience, it is anticipated that sufficient information will be available to insure that areas included in the sale will not present unacceptable environmental risks. In the past, most sensitive areas and conflicts have been identified initially at the Call for Information stage when the area under consideration is quite broad. However, it is conceivable that, because of biological sensitivity, special hazards, cultural resources and multiple-use conflicts, would not have been included for consideration in the more limited tract specific analysis. Later stages of analysis will be relied upon to provide the necessary safeguards against activities which might adversely affect resources. It might be expected that this change from the specific to the general could result in a certain indeterminate number of tracts that previously would not have been considered suitable for leasing being leased. The time allotted for response to the Call for Information is reduced. However, since the entire planning area will be up for consideration, respondents will not be required to wait for the call area to be identified as in the past, before preparing their comments. Instead, once a schedule is approved, organizations and individuals will be able to prepare, as far as three or four years in advance, replies to the various calls for information.

2. Area Identification

Offering for lease an area covering all or nearly all of an entire planning area will have a number of different effects. First, industry will be able to consider leasing throughout the identified area; therefore, consideration will have to be given to planning, by state and local governments, for possible development scattered over a very large area. It is expected that information will quickly become available concerning the location of most promising hydrocarbon producing sections, and planning will concentrate on development in those areas. The possibility will remain, however, that leasing and development may occur beyond the areas *expected* to be developed, causing impacts where not fully anticipated. Any studies designed to provide information about the assumed high potential leasing areas might have their value partially or totally reduced by unexpected development in an unstudied area. However, most presale studies will be broad studies covering much of a planning area.

Finally, area-wide offerings will open a much larger area to adverse environmental impacts. This may be less critical in the Central and Western Gulf of Mexico than in other OCS regions, since leasing in the Gulf has been relatively widespread in the central and western parts. In the Eastern Gulf and other parts of the OCS, the area subjected to impacts can be expected to expand from that of presently active areas.

3. Area-Wide EIS

Environmental impact statements covering large OCS areas are now being prepared for sales under the current schedule and leasing system. Emphasis can be and is placed on the specific set of tracts nominated for leasing, but in reality much of the planning area is analyzed only as thoroughly as time and available information permits. Under the area-wide concept, an entire planning area will not be treated as having marine and hydrocarbon resources distributed evenly across it. Areas where oil and gas are believed most likely to occur will be identified and the analysis will focus on the effects of OCS activities there. DOI will prepare the analysis in much the manner of the present tract-specific EIS. The area-wide EIS will include thorough consideration of the expected quantities of oil and gas resources, their expected location, exploration and development scenarios, transportation systems, potential spill locations, statistics of potential spill frequencies, their fates, and potential risks and conflicts with other marine and coastal resources. As a result of the Geology Report (see Section II.A.) and the Call for Information, determinations will be made concerning the most likely locations for hydrocarbon resources. Additionally, areas which warrant particular consideration will be delineated. Special stipulations or lease terms will be designed and evaluated in order to mitigate potential impacts. In this sense, there will be few changes in the way OCS lease sale EIS's are prepared.

4. Geohazards Evaluation

Because specific tracts will no longer be identified early in the preleasing process, and because up to 2,000 more lease blocks could be considered hydrocarbon prone, tract specific geohazards surveys will no longer be possible. Instead, a general geohazards evaluation will be available for inclusion in the EIS. This general hazards evaluation will be based on regional characterizations which will focus on areas of high oil and gas potential and areas with the greatest potential for geologic hazards, such as slopes. Under these circumstances, the EIS will only identify broad areas of potential hazardous conditions (see Section I.B.4.). Site-specific goehazard surveys will be required of lessees for approval of exploratory and development plans. Should operations not be possible at the chosen site, an operator may be required to relocate to other parts of a lease, or a permit issued to operate from outside the lease. In extreme circumstances, where operations simply cannot be carried out in an environmentally acceptable manner, the Secretary may cancel the lease. In this case the operator would be entitled to compensation (see Section I.B.4.e.).

5. Planning Area Boundary Changes

The Department of the Interior is also proposing to make changes in the boundaries of the OCS planning areas (compare maps in Section III). In the Atlantic OCS the biggest change is the combination of the North and Mid-Atlantic areas into a new, much larger North Atlantic planning area. The principle significance of this will be to combine sales formerly split between the North and Mid-Atlantic OCS leasing areas. Under the June 1980 program, sales

have been alternated between the two regions and the South Atlantic so one sale could be expected in each area about once every three years. Under the proposal, sales are scheduled to occur once every two years within the larger proposed planning area. Except for the effects associated with the closer spacing of sales, the impacts of combining these two areas should not be significant.

In the South Atlantic area, two changes have taken place. The Blake Plateau has been combined with the South Atlantic planning area, and the southern boundary has been extended southwards along the Florida coast beyond Cape Canaveral. Neither change is expected to have a significant effect since Blake Plateau leasing will cause coastal development to occur in the same locations that more nearshore leasing would, and the extension of the boundary southward merely expands the planning area into a geologic province presently expected to have no hydrocarbon potential. If this area were to prove hydrocarbon prone, however, the change would result in a higher probability of impacts occurring off the east coast of Florida.

The division of the Gulf of Mexico into three subunits of the larger planning area will mean that the Eastern Gulf will be subject to annual sales. Dividing the western and central areas of the Gulf should result in more effective planning for the development of these two nonfrontier areas.

The elimination of the small Santa Barbara planning area in California will have little actual effect since it has been included as part of the southern California call areas in recent sales. However, the decision to combine the two into one planning area removes the option of scheduling sales separately in the future, and in that manner reducing the rate of leasing.

Adding a planning area to the west of Kodiak (Shumagin) identifies a specific planning area in a part of the OCS which has not been previously proposed for leasing consideration. Including Shumagin in Sale 100 could ultimately result in leasing and development and attendant impacts in this region.

Expanding the former North Aleutian shelf leasing area to include all of Bristol Bay, renaming it the North Aleutian Basin, and offering the entire planning area for leasing introduces the possibility of OCS-related impacts occurring within the sensitive fishing grounds of Bristol Bay. However, the most promising formations are outside of the heaviest fishing areas. This should serve to reduce the potential for environmental impact and multiple use conflicts within this planning area.

Subdividing the St. Georges Basin into three areas, Bowers Basin, Aleutian Basin and a smaller St. George Basin will have little practical effect since there is presently no apparent industry interest in the Bowers and Aleutian Basins. The subdivision serves only to focus the area of study and planning on the actual locations of industry interest.

Changing the Navarin Basin eastern boundary to 174° W and defining a new area, St. Matthew-Hall, will serve to remove the direct possibility of leasing taking place along the central Bering Sea coast. Leasing, development, and direct impacts on marine ecosystems will take place no closer than 250 miles to the mainland, although the effects of oil spills and onshore support bases will extend beyond the lease area and could likely impact portions of the coast in the region.

In moving the boundary between Barrow Arch and Diapir Field to the west, a large area northwest of Point Barrow, in what was formerly in the Chukchi Sea palnning area, becomes part of the Diapir Field. Under these circumstances the area now in Diapir Field will experience three sales instead of one if it had become a part of the Barrow Arch. There is, therefore, a potential of

more activity taking place in that area as a result of the boundary change. Much of the area subject to increased leasing is away from the coast and the effects of activity in the area would be some distance from land. Actual increases in activity (and hence environmental impacts) would depend on whether industry interest in the North Slope fields extended far enough to the west to take in the area.

D. Environmental Consequences by Planning Area

Definitions of Level of Expected Impact: The following definitions are employed in this chapter to describe the level of impacts expected to occur to each individual resource category as a result of OCS oil and gas activities. The levels of expected impact on a regional (planning area) basis are included in the tables at the end of each alternative for each planning area and in the Program Overview Table in Chapter III.

COASTAL ECOSYSTEMS

VERY HIGH - A species or assemblage will become threatened or endangered.

HIGH - A significant long-term interference with ecological relationships. This usually involves the mortality or a biological alteration of a noticeable segment of the population, community, or assemblage.

MODERATE - A significant short-term interference with ecological relationships. Although some species may sustain substantial losses, other species will sustain low losses.

LOW - An interference with ecological relationships that is not particularly significant to either the relationships or the species, community, or assemblage.

VERY LOW - Loss of a few individuals but no interference with ecological relationships.

WATER QUALITY AND SUPPLY

-- WATER QUALITY--

VERY HIGH - Water quality parameters change significantly several orders of magnitude, toxic trace metals or hydrocarbons exceed EPA safe levels, changes persist for months or longer.

HIGH - Water quality parameters change significantly one or two orders of magnitude, toxic trace metals or hydrocarbons near EPA safe level, persisting for days to weeks.

MODERATE - Statistically significant changes in water quality parameters which persist for several weeks.

LOW - Some measures of water quality deviate significantly from ambient measures but are quickly (within 1-2 days) restored to normal.

VERY LOW - Normal measures of water quality such as oxygen content, salinity, temperature, transmittance, trace metal concentrations, and hydrocarbon levels show no stable statistically significant changes from ambient conditions.

-- WATER SUPPLY--

VERY HIGH - Regional water supply substantially affected requiring facility construction, facility expansion or a new source of water.

HIGH - Water supply in several areas substantially affected requiring modification of existing facilities.

MODERATE - Water supply in one area noticeably affected stressing existing facilities.

LOW - Minor stress on local water supply.

VERY LOW - No noticeable affect on water supply.

NAVIGATION AND SHIPPING

-- MARINE TRAFFIC--

VERY HIGH - Vessel conflicts occur frequently. Re-routing of all shipping traffic, or creation of a new routing system would be necessary.

HIGH - Vessel conflicts occur frequently. Re-routing of some shipping traffic would be necessary.

MODERATE - Vessel conflicts occur frequently. Re-routing of shipping traffic not necessary.

LOW - Vessel conflicts occur, but are minor in character and infrequent.

VERY LOW - Vessel conflicts rarely, if ever, occur and when they occur, conflicts are always minor.

-- PORTS AND HARBORS --

VERY HIGH - New ports or harbors would be required.

HIGH - Additional docks, berths, and facilities would be required.

MODERATE - Some new facilities would be required but major expansion or renovation not necessary.

LOW - Minor expansion of existing facilities would be required.

OTHER USES OF THE OCS

-- MILITARY USES --

VERY HIGH - Exclusive-use area would have to be completely shifted, curtailed, or eliminated. Extensive alterations or reductions to military operations would be required.

HIGH - Exclusive-use areas would have to be somewhat shifted or reduced. Significant alterations or reductions to military operations would be required.

MODERATE - Exclusive-use areas would have to be shifted or reduced slightly. Moderate alterations or reductions to military operations would be required.

LOW - Exclusive-use areas would have minimal overlap with resource development areas. Almost no alterations or reductions to military operations would be required.

VERY LOW - No alterations or reducitons of military operations would be required.

-- OCEAN DUMPING --

VERY HIGH - Operations would disturb an existing dump site resulting in contamination of the water column over a large area, or operations would prohibit use of the area as a dumpsite.

HIGH - Operations would disturb an existing dump site possibly resulting in contamination of the water column over a large area, or operations possibly would prohibit use of the area as a dump site.

MODERATE - Operations may disturb an existing dump site resulting in contamination of the local water columns or operations may have some conflicts with use of the area as a dump site.

LOW - Operations may disturb an existing dump site resulting in contamination of the local water column, or operations may have some conflicts with use of the areas as a dump site.

VERY LOW - Boundary lines might overlap but operations will not disturb any existing dump sites, or operations will have no conflicts with use of the area as a dump site.

--OFFSHORE OIL AND GAS INFRASTRUCTURE --

VERY HIGH - Affected infrastructure would have to be completely replaced. Down time would exceed one month.

HIGH - Affected infrastructure could be repaired with some replacement. These activities would result in over one week of down time.

MODERATE - Affected infrastructure could be repaired with some replacement. These activities would result in down time of a few days to one week.

LOW - Affected infrastructure could be repaired, with little, if any, replacement. Down time would be only one or two days.

VERY LOW - Affected infrastructure could be repaired in a short time.

LAND USE

VERY HIGH - Industrial and other uses such as recreation, housing, etc. are completely incompatible (e.g. a support base in a recreation area); land use plans prohibit OCS related land use.

HIGH - Highly incompatible use between industrial and other uses such as recreation, housing, etc., or sitings in a residential, urban or natural area which results in impacts of nuisance, noise, traffic; little or no mitigation (buffer zone, distance or proximity) or sitings where no land use plans are in place.

MODERATE - Moderate incompatibility which may be caused by siting requests that result in changes to existing land use plans and which still allow a lesser degree of the above impacts; or sitings occur in rural or natural areas adjacent to other developments (e.g. a support base near a farm site).

LOW--Low incompatibility because impacts are obviated or mitigated by land use plans, CZM plans, and Federal, State, and local regulations and permitting procedures which already exist. It is assumed that sitings must meet specifications before permits are granted.

VERY LOW - No incompatibility because sitings would easily meet specifications or requirements, if any are required.

CULTURAL RESOURCES

VERY HIGH - Many cultural resources are expected to be present and disturbed.

HIGH - A few cultural resources are expected to be present and disturbed.

MODERATE - Significant possibility of both presence and disturbance of cultural resources.

LOW - Remote possibility of presence and disturbance of cultural resources.

VERY LOW - No cultural resources likely to be present.

COMMERCIAL FISHERIES

VERY HIGH - A 30 percent or greater economic loss to the industry. Many fishermen out of work and secondary employment (processing plants, etc.) substantially affected.

HIGH - A 10 percent or greater economic loss to the industry. Some fishermen out of work and secondary employment affected.

MODERATE - Less than 10 percent economic loss to the industry. Some financial loss to fishermen and secondary employment, but not measurable against losses due to the natural variation in fish and shellfish stocks.

LOW - A small economic loss to the industry. A few fishermen affected but no effect on secondary employment expected.

VERY LOW - Economic loss insignificant.

ENDANGERED SPECIES

Definitions for COASTAL ECOSYSTEMS also apply to this resource category with the exception of VERY HIGH which, for this category, denote that a species may become extinct or placed in jeopardy (of extinction).

HABITATS AND RESOURCES OF SPECIAL CONCERN

Definitions for COASTAL ECOSYSTEMS also apply for this resource category.

AIR QUALITY

VERY HIGH - Widespread areas within a nonattainment area likely to be impacted by both onshore and offshore sources. Large emission control and offset costs likely.

HIGH - Numerous locations within a non-attainment area, or widespread areas within an attainment area likely to be impacted. Large emission control and/or offset costs likely.

MODERATE - Few areas within a non-attainment area or numerous local areas within an attainment area likely to be impacted. Moderate emission controls and/or offset costs likely.

LOW - Little impact within a non-attainment area, or a few areas impacted in an attainment area. Normal emission control strategies likely.

VERY LOW - No impact in a non-attainment area, or little impact in an attainment area.

RECREATION

-- COASTAL RECREATION --

VERY HIGH - Complete closure of all water-oriented recreation facilities for any length of time, or partial closure for an extended period of time.

HIGH - Closure of most water-oriented recreational facilities. Some beach and water use possible.

MODERATE - Partial closure of some water-oriented recreational facilities. Most beach and water use still possible.

LOW - No closure of water-oriented recreational facilities. Most beach and water use still possible.

VERY LOW - No closure of water-oriented recreational facilities. All beach and water use occuring with minor inconveniences, if any.

-- VISUAL RESOURCES--

VERY HIGH - Visual quality degraded to an extent that it affects all people in the area. Reduced recreational visitation to the area. Reduced property values.

HIGH - Visual quality degraded to an extent which affects most people in the area. Reduced recreational use of the area. Reduction in property values likely.

MODERATE - Visual quality degraded to an extent which affects about half the people in the area. No noticeable reduction in recreational use. No perceptible reduction in property values.

LOW - Minor degradation in visual quality. Most people accept the change. No reduction in recreational use or property values.

VERY LOW - No significant reduction in visual quality. Few people notice changes. No reduciton in recreational use or property values.

SOCIOECONOMIC FACTORS

VERY HIGH - Potentially significant long-term stress on public and private services and facilities; an increase of greater than 20 percent of the baseline population of the affected area.

HIGH - Potentially significant short-term and minor long-term stress on public and private services and facilities; an increase of 10 to 20 percent of the baseline population of the affected area.

MODERATE - Moderate short-term stress on public and private services and facilities; an increase of 5 to 10 percent of the baseline population of the affected area.

LOW - Minor short-term stress on public and private services and facilities; an increase of 1 to 5 percent of the baseline population of the affected area.

VERY LOW - No significant stress on public and private services and facilities; an increase of less than one percent of the baseline population of the affected area.

NATIVE SUBSISTENCE CULTURES

VERY HIGH - An endangered village subsistence resource would become unavailable for an indefinite period of time, or an important village subsistence resource would become threatened or endangered and unavailable for an indefinite period of time, or village sociocultural systems would be stressed by these or other causes to result in long-term chronic disruption of village sociocultural systems (such as derived from ambivalence to competing value systems and orientations) and long-term chronic effects (such as family fragmentation and social pathologies).

HIGH - One or more village subsistence resources locally available would become locally threatened and locally unavailable for a period of 1-3 years, or village sociocultural systems would be stressed by these or other causes to result in long-term periodic disruption of village sociocultural systems and long-term chronic effects.

MODERATE - One or more village subsistence resources locally available would become locally threatened and locally unavailable for a period of time not exceeding one year, or village sociocultural systems would be stressed by these or other causes to result in short-term disruption and effects.

LOW - Village subsistence resources locally available would be affected but not to a significant degree in relation to the resources or habitat for a period of less than one year, or village sociocultural systems would be stressed by these or other causes to result in limited disruption without long-term effects.

VERY LOW - Village subsistence resources locally available would be affected only to the degree of a loss of small number of individual fish or wildlife with no short-term interference with ecological relationships, or village sociocultural systems would be stressed by these or other causes to result only in limited disruption without short-term effects.

Mitigation-Measures: Existing laws, regulations, and orders designed to reduce adverse impacts of offshore oil and gas development are assumed within the analyses below. Examples include the OCS Lands Act, which grants broad authority to the Secretary of the Interior to control lease operations, the OCS Operating Orders, coastal zone management regulations, the Fishermen's Contingency Fund and the Offshore Oil Spill Pollution Fund. Sections I.B.4 and 5 of both the FEIS and the FSEIS contain detailed information on the primary mitigation measures. The mitigating effect of these measures has been factored into the environmental impact analysis discussed in this document.

Additional measures have been employed for past OCS lease sales to further mitigate impact resulting from a specific sale. These mitigation measures (lease stipulation and Notice/Information to Lessees) vary from area to area and are designed to protect unique cultural biological (including specific species) and economic resources as well as human life. In many cases the stipulations protect the resource directly as well as reduce the probability of an oil spill. Such protection includes surveys, siting restrictions (pipelines and platforms), special equipment or design requirements (e.g. shrounding or burying pipeline valves or other protrusions), seasonal drilling restrictions, special training of hydrocarbon resources requirements, discharge restrictions, and coordination requirements (esp. with military or NASA).

A Secretarial decision on appropriate application of stipulations and other discretionary mitigation measures is made prior to each lease sale. Potential lease stipulaitons have not been factored into the environmental impact analysis for any of the alternative lease schedules discussed in this document.

1. North Atlantic (Maine to North Carolina)

a. Alternative I-1: The Proposed Schedule with Planning Area-wide Offerings

1) General Impacts

a) Impacts on Coastal Ecosystems

Coastal ecosystems potentially affected by the proposed lease sales under this alternative include rocky shores, bays and estuaries bordered by saltwater marshes, sandy beaches, and barrier islands or sand dune systems and their associated fish and wildlife resources. Rocky shores predominate along the coast of Maine, white sandy beaches with dune systems are predominant throughout the rest of the planning area. Major estuaries include Chesapeake, Delaware, and Raritan Bays.

Approximately three oil spills greater than 10,000 barrels might occur over 35 years. Important variables that determine the extent of damage an oilspill would cause these systems include the amount and toxicity of the crude, the degree of weathering the crude has undergone, weather conditions at the spill site, the water depth and suspended sediment load, the cleanup method attempted, and previous exposure to oilspills. If oil from a spill reached sandy beaches or barrier islands, it could catch in nearshore vegetation, mix with the waves, and despoil and sand and mud flats to the high tide line. If the wave action is vigorous against the shore, the oil could be quickly mixed with nearshore and onshore bottom sediments, where rates of biodegradation could be slow and where the oil may be periodically reexposed by wave action or currents. The appearance of the beach would be marred by the crude or weathered oil before the oil penetrated the sand or was mechanically removed. The removal of sand by heavy equipment would contribute further to the destruction of the beach/dune area, possibly requiring extensive revegetation. On rocky shores, oil would coat and discolor rocks and kill most of the attached benthic fauna. As with other coastal habitats, crude oil could persist in the sediments for several years inhibiting the return of a stable benthic community. Oil reaching estuaries or marshes in the North Atlantic region may have serious biological effects theres. Because estuaries tend to act as nutrient traps, estuarine organisms can be exposed to long periods of contamination. Since many of these organisms are living at or near the limit of their tolerance range, mortality could be high. <u>Spartina spp</u>. of the east coast salt marshes have been shown to withstand moderate single dose of hydrocarbons but continuous applications prove lethal because the oil kills the roots and rhizomes. All marsh plant species would probably be most affected by a spill during the summer growing season, when the oil could influence flowering, vegetative reproduction, and seed development.

Approximately two-thirds of the Atlantic's commercially valuable fish and shellfish stocks are estuarine dependent during some stage of their developments. Approximately one million waterfowl, shorebirds, wading birds, and birds of prey use coastal areas for breeding, feeding, migrating, and overwintering. In general, fish and wildlife can be killed outright by contactng spilled oil, or suffer sublethal adverse effects such as reduced breeding success, behavioral changes, or loss of preferred habitat.

Because a relatively high number of oilspills (1 from production and 5 from transport to shore) over 1,000 barrels could result from oil development and production in the proposed planning unit, coastal ecosystems could be exposed to one or more spills. The barrier islands, sandy beaches, and salt marshes bordering the approaches to the Delaware and Raritan Bay refineries could be particularly vulnerable to OCS tanker spills. The coastal ecosystems from Atlantic City, New Jersey to the Delaware Bay could be vulnerable to any pipeline spills that might occur but less than 2 pipeline spills are estimated. If production takes place in deeper offshore waters as anticipated, any oilspills from the production area would pose a negligible threat to all coastal areas. However, if any production takes place in shallow nearshore waters, the probability of an oilspill contacting shore will increase. Due to the location of existing Mid-Atlantic refineries and to the prevailing winds and ocean currents (which are generally from the north and west), coastal ecosystems (principally rocky shores and sandy beaches) north of Cape Cod, MA, face a minimal risk of being exposed to an OCS-related oilspill. The greater risks occur south of Cape Cod.

Adverse impacts to coastal areas could occur as a result of the construction of pipelines and onshore facilitites. Trenching and burying pipelines nearshore and onshore up to the supratidal zone would disturb the sea bottom and resuspend sediments. In marshes and estuaries, trenching or dredging may alter circulation patterns, tidal flow and salinity gradients. Erosion of pipeline canals in marshes can cause significant losses of this habitat type if the adverse effects are not mitigated.

In beach and barrier island areas, pipeline burial in the surf zone would disrupt and rework sand and mud, resuspend sediments, temporarily change the beach profile, and remove indigenous submerged vegetation in a zone of about 15 meters in width. Pipeline rights-of-way would also be cleared above the high tide line. If pipelines are installed in areas containing dunes, the dunes may take from a few to many years to recover, depending upon their size and the recovery measures employed. Under the proposal, three pipelines could be needed. Each of these pipelines would disturb sandy beach areas for a short term period at each landfall during their construction phase. An oil pipeline could pose an additional threat to coastal ecosystems by way of an oilspill. Assuming that this pipeline spill occurs in the vicinity of Atlantic City, New Jersey, there is a 5% or less probability that the spill would contact shore in the vicinity of Atlantic and Cape May Counties, NJ (FES OCS Sale No. 59, Appendix D, Table 10). Although this probability is very low, it suggests that beaches, salt marshes, and barriers islands of southern New Jersey could be vulnerable to an OCS oil pipeline spill.

Conclusions: Some degradation of coastal areas could result from oilspills with wetlands and beach/dune ecosystems bordering the entrance of the Delaware and Raritan Bays and the New Jersey shoreline south of Atlantic City being most vulnerable. Coastal fish and wildlife in these areas can suffer high mortalities if a spill reaches their habitats. Pipelines will have a short-term adverse effect on coastal areas during their construction phase. Overall, the impact on coastal ecosystems resulting from this proposal would be moderate.

Cumulative Impacts. In the unlikely event that all tracts are leased and developed over the life of the proposal, a total of 16 spills (3 from

production and 13 from transportation) over 1000 barrels each may occur over the life of the field. An estimated 93 spills greater than 1,000 barrels each could occur over a 30 year period from imported petroleum products. Since a total of approximately 96 oil spills greater than 1,000 barrels each could occur when all resources are considered (assuming OCS transportation spills substitute for an equal number of imports), the probability of one or more spills contacting sensitive coastal ecosystems could be very high. A total of 6 pipelines (1 oil and 5 gas) will be trenched through coastal areas under the cumulative case. An additional threat to these ecosystems comes from private construction and development of coastal areas in the region. Therefore, the cumulative impact to coastal ecosystems from OCS oil spills and pipeline construction, imported spills, and from coastal development will probably result in the degradation or loss of some coastal habitats, particularly in the vicinity of existing petroleum refineries and developing urban and resort areas.

Under the proposal, 6 oil spills (1 from production and 5 from transportation) over 1000 barrels each may occur and 3 pipelines (1 oil and 2 gas) are projected. This indicates that the proposal contributes significantly (38%) to the cumulative number of estimated OCS spills, but not significantly (1%) to the total number of OCS and imported spills combined. Also under the proposal, 50% of the total number of projected pipelines will be constructed. Therefore, the proposal is expected to make a significant contribution to the anticipated cumulative impacts from OCS development, particularly from oil spills and pipeline construction. However, in comparison to the total cumulative case (present and future OCS and non-OCS activities), the proposal does not contribute significantly to the total. When the proposal is contrasted with existing OCS development and non-OCS activities only, it still does not contribute significantly to the total number of potential oil spills and their associated impacts.

b) Water Quality and Supply

(1) Offshore Water Quality: Pollution sources which would affect the offshore water quality within the North Atlantic Planning Area are: drilling muds and cuttings; formation waters; oilspills and chronic discharges of oil; domestic and sanitary wastes; discharges from routine vessel and tanker activity; pipeline installation; gas blowouts; and pipeline breaks. The impacts of each of these forms of pollution is discussed below:

Drilling Muds and Cuttings: Drilling muds and cuttings are traditionally discharged into the marine environment during routine drilling operations. (Stipulation No. 4 for Sale No. 42 required that these discharges be shunted 20 to 50 feet below the surface.) Under this alternative, 134 exploratory wells and 698 production wells are expected to be drilled. On the average for an exploratory well, 10,000 to 30,000 barrels of drilling muds and 3,000 to 6,000 barrels of cuttings are discharged into the water column depending on the well depth and varying drilling practices (Ayers, 1981). On this basis, approximately 1,340,000 to 4,020,000 barrels of muds and 402,000 to 804,000 barrels of cuttings could be discharged within the planning area during exploration under this alternative.

The average volume of drilling materials that would be discharged for development and production wells would be substantially less than that for an

exploratory well. This is due to the fact that when wells are drilled for production purposes, mud may be reused depending on drilling conditions, mud property requirements, the presence of contaminents, and mud storage facilities.

During both exploratory and development drilling, due to the rapid settling of the bulk of the materials (over 90% in less than one hour), and the dilution and dispersion of the remaining particles, overall impacts on water quality would not be significant.

Dissolved oxygen, pH, salinity, and temperature would be affected only in the immediate vicinity of the discharge. Temperatures and pH may become slightly elevated while oxygen and salinity could decrease. Measurements of these parameters at 40 meters from the point of discharge have shown them to be unchanged from background levels. Thus, beyond the immediate area of discharge, the parameters that would be affected by drilling materials are the levels of suspended solids and degree of light transmittance. Transmittance is the only hydrographic variable found to be affected (Ayers et. al., 1980; Ayers et. Al., 1980a).

The bulk of discharged drilling materials would decrease rapidly around the point of discharge. The only time concentrations of whole muds in the water column would approach laboratory bioassay 96-hour LC50 values of 10,000 to 100,000 ppm is when the discharge is actually occuring and only in the immediate vicinity of the discharge pipe (Ayers, 1981a). Depending on the rate of discharge and on local hydrographic conditions, the remaining suspend solids concentrations could be reduced to .01 percent or less, from less than 1 to 10 ppm, within 100 meters of the actual discharge. This is far below the concerntration range of 100 to 1,000 ppm that most investigators have noted as having sublethal effects on marine biota (Ayers, 1981a).

Due to continued settling and dispersion, and depending on hydrographic conditions, suspend solids would normally reach background levels within 1,000 meters downcurrent, corresponding to a transport time of less than 2 hours (Ayers, 1981a). During a rig monitoring study on Mid-Atlantic OCS Block No. 684 suspended solids reached background levels within 350 to 600 meters of the discharge source (Ayers et. al., 1980).

However, on Georges Bank, a high energy area, in monitoring for the C.O.S.T. well Atlantic G-1, it proved difficult to locate any downcurrent plume due to the rapid dilution of the discharges.

Transmittance values would reach background levels at a slightly greater distance than suspend solids due to the presence of colloidal particles in the water column. In the Mid-Atlantic, transmittance values have been observed to reach background at 800 to 1000 meters downcurrent of the source, depending on the rate of discharge (Ayers, et. al., 1980).

Soluble components would undergo the same general dispersion characteristics as the fine particulate fraction, and become well mixed in the water column within a few hours of discharge. Dilution ratios for soluble components have been estimated to be two orders of magnitude lower than those of the solids components (Ayers et. al., 1980).

Trace metal dilution rates, as measured by suspended solids concentrations, have been shown to be similar to that of whole muds (Ecomar, 1978; Zingula, 1975). Elevated trace metal concentrations are usually limited to within 1000 meters of the discharge point. For the Georges Bank C.O.S.T. well G-1, background levels of barium and chromium were reached within 183 meters downcurrent of the drillsite in the direction of major flow (ENDECO, 1976). However, in other areas heavy metals have benn shown to accumulate in sediments as far as 2 miles downstream from the discharge site (Ecomar, 1978; Dames and Moore, 1978; Mariani et. al., 1980). Materials discharge in deeper waters of the slope and rise would also dilute or settle out according to observations made during studies conducted on the shelf. Although slower currents along the shelf would not promote dispersion of the heavier particles, this would be mitigated by the increased settling distance afforded by the greater water depth, and result in a wide area of deposition, the extent of which would depend on local hydrographic conditions. Lighter materials that form the upper plume would disperse to background levels within 1000 meters of the point of discharge.

For George Bank, rapid initial dilution rates of 500:1 to 1000:1 could be expected within a few meters downstream of the point of discharge, with dilutions of 10,000:1 occuring within 100 to 200 meters. Within this distance, concentrations of whole muds (containing 250,000 mg/l solids) could be diluted to about 100 mg/liter (with 25 mg/liter suspended particulates) in about 6 minutes.

It has been hypothesized that on the crest of the Bank, turbulence within the gyre would tend to maintain smaller clay particles in suspension long enough for transport off the Bank, exiting from the northern flank of the Bank to be deposited in the Gulf of Maine (Houghton et. al., 1981). However, the turbulence of this area would promote rapid dilution and wide dispersion of these materials in the large volume of receiving water to background levels on a time scale orders of magnitude shorter than that on which the gyre operates (hours vs months) (EG&G, 1981).

Dispersion of discharged solids on the southern flank of Georges Bank would vary, depending on the hydrographic conditions at the time, but generally, from shallow water (30 to 60 meters) to the shelf break (200 meters), the area of initial deposition of heavier materials would increase by a factor of 7 to 10, largely as a result of the increased trajectory provided by the greater water depth (Houghton et. al., 1981). On the slope, areas of deposition would increase to an even greater degree.

Concentrations of barium and chromium on Georges Bank would be well below natural background concentrations found in sea water (0.050 and 0.001 mg/l, respectively). Zinc and all other trace metals would be an order of magnitude lower than chromium.

Within the North Atlantic Planning Area is an annually-recurring oceanographic feature termed the "cold band." This is a lens-like band of water along the shelf bounded on top by the seasonal spring-summer thermocline, offshore by the shelf-slope front (the boundary between shelf and slope waters), and inshore by a vertically well-mixed zone. It extends from Georges Bank to Cape Hatteras. Mixing between waters of the cold band and adjacent waters (including the accompanying transfer of materials) is generally reduced. Concern has been

expressed that the cold band may reduce dilution of materials dicharged within it. However, this mass of water is very large (30-50 kilometers wide) relative to the area affected by discharged drilling materials. Thus, localized hydrographic features would dilute and disperse these materials in the water column to background levels before they could be influenced by the cold band.

Similarly, Gulf Stream eddies that enter the Atlantic slope region are also large scale phenomena relative to the localized dispersion of drilling discharges. Hydrographic features would therefore dilute these materials to background levels before the movement of an eddy could affect their transport, and drilling discharges would disperse as observed in other areas. The same would also apply to materials discharged within the Gulf Stream.

The position of the shelf-slope front may also influence the dispersion and resuspension of drilling materials. The front generally moves from the region of the 100-meter isobath out to the shelf break and onto the upper slope. due to temperature and salinity gradients between the two water masses (shelf and slope), this is a zone of enhanced turbulence which could promote dispersion of discharges within the water column and resuspension of bottom materials. However, the front is not a traveling water mass that would entrain materials upon discharge and transport them to other regions.

Formation Waters: Formation waters discharged during production would undergo dispersion similar to that described for fine particulate and liquid drilling discharges whereby they would be rapidly diluted and ultimately lost in the large volume of receiving water. Also, because the concentration of discharges would be widely spaced over time and area, the impacts on water quality would not be significant. any effects would be temporary and localized around platforms to within a few hundred meters from the discharge point, depending on local hydrographic conditions.

Where production platforms are in operation over a long period of time, trace metals which are insoluble in sea water could accumulate in the surrounding sediments. Dissolved elements and their respective concentrations will depend on formation characterisitics.

Increases in soluble trace metal concentrations would be localized around platforms and, depending on hydrographic conditions, would become diluted to background levels within a few hundred meters. Due to the relatively high density and low oxygen content of formation waters compared to sea water, if large volumes are discharged near the bottom in deeper areas where bottom turbulence is not strong, high density flows of low oxygen water could result. If formation waters are discharged near the surface, however, they would rapidly disperse in the water column within a few hundred meters and thereby have no substantial effect on ambient water quality.

The hydrocarbon content of discharged formation waters would be within EPA's prescribed limits: Based on EPA's maximum allowable monthly average concentration of 48 mg/l. On a yearly basis this amount would not be significant, as only small, localized incremental increases of hydrocarbons would occur at any given time. Hydrocarbons discharged in formation waters are present as small droplets or a dissolved form and upon discharge rapidly disperse in the large volume of receiving water.

Oil Spills: The most significant impacts on offshore water quality would result from the six oil spills in excess of 1000 barrels expected to occur under this alternatives. Large acute oil spills and chronic low level discharges of oil could occur from drilling platforms, gathering lines from subsea complexes, exploration vessels, survey ships, tanker operations, and other marine support vessel activity expected to occur. Small chronic spills (of less than 1 barrel) during routine operations are more likely to occur, however.

Both large acute spills and smaller chronic discharges of oil will impact water quality in the planning area. These impacts would depend on the actual behavior and fate of oil in the water column (e.g. movement of oil; rate and nature of weathering), which in turn, would depend on the oceanographic and meteorologic conditions present at the time. Oil remaining in the water column after evaporation and dissolution of the lighter molecular weight fractions could undergo any of several weathering processes, including dispersion, emulsification, tar ball formation, and photo-oxidation. Photo-oxidation could result in the formation of toxic products in the water column. The ultimate fate of an oilspill is difficult to predict as it depends on a large number of variables. The effect on ambient open ocean water quality would be significant although temporary in the case of large acute spills and far less significant but cover a longer time span (although not permanent) in the case of chronic discharges. Eventually, weathered oil would sink to the bottom where it could become incorporated into the sediments to undergo further chemical and biological oxidation.

In high energy areas such as the Georges Bank, turbulent hydrographic conditions would tend to maximize the breakup and dispersion of spilled oil and thereby its weathering. On the crest of the Bank, however, weathered oil could also be circulated within the gyre system before complete degradation occurs or before it is transported off the Bank at one of the potential exit areas, possibly entrained by Gulf Stream eddies and carried out to the Gulf Stream. According to findings of BLM's New England Physical Oceanography program, residence times can be as long as 80 days. Routine petroleum discharges associated with deck drainage, ballast water, etc. are subject to EPA NPDES permit requirements. Oil in areas subject to chronic discharges could cause temporary, localized impacts on water quality. These impacts would not be significant because for the entire planning area no more than 134 exploratory wells are expected to be drilled under this alternative. Deck drainage is primarily associated with drilling rigs, not production platforms and it is unlikely that all rigs would be concentrated within one particular region. Also, the same forces that promote the dispersion and degradation of large acute spills would also act upon chronic discharges of oil in deck drainage.

Domestic and Sanitary Waste: Domestic and sanitary wastes will be discharged from drilling rigs and platforms. On the average, approximately 6,000 gallons per day are discharged at each exploratory well site and 5,000 gallons per day at a development site. The discharges would be subject to EPA NPDES permit regulations.

Plume models (Massachusetts Institute of Technology, 1973; Mobile Plume Model, 1976) indicate that sanitary waste effluents are rapidly dispersed and diluted in the water column. Impacts on water quality would consist primarily of an increase in suspended solids (organic material) and accompanying BOD, and a

decrease in oxygen levels in the water column. In addition, low levels of discharged chlorine could eventually form toxic compounds. Impacts from these discharges, however, would be localized near the point of discharge, and pollutants would be diluted and dispersed in the larger volume of receiving water.

Pipeline Installation: Installation of the one oil and two gas pipelines will resuspend sediments on both the slope and shelf and thereby cause temporary increases in water column turbidity. The magnitude and extent of any increase in turbidity would depend on hydrographic factors operating at the time of installation, on the duration of activity, and on the type and grain size of the bottom materials. Generally, the sandy substrate found on the shelf would not remain in suspension as long as the finer materials of the slope. Suspended sediments would be dispersed and transported in the prevailing current direction and eventually become redeposited. Overall impacts on water quality due to pipeline installation, would be temporary and insignificant due to dispersion in the large volume of receiving water.

Gas Blowouts and Gas Line Breaks: Breaks or ruptures of gas pipelines could occur although the probability and frequency are very low. Gas released into the water column would probably result in increased levels of light molecular weight hydrocarbons (C2 to C5) which would subsequently evaporate into the atmoshere. Areas of up to 25 square miles have been reported to be affected in this manner (Parker, 1974). Concentrations would however, return to background levels after the gas flow had been curtailed. The most significant effect of gas blowouts would be the localized disturbance of sediments, resulting in temporary water column turbidity. Impacts from pipeline accidents, however, are considered to be temporary and would not cause significant impacts on water quality.

<u>Conclusions</u>. Impacts to offshore water quality would be low because this proposal would result in temporary and localized deviations from ambient measures.

<u>Cumulative Impacts</u>. In the unlikely event that all tracts offshore the North Atlantic are leased and developed over the life of the proposal, a total of 16 spills (3 from production and 13 from transporation) over 1000 barrels each may occur over the life of the field. An estimated 93 spills greater than 1,000 barrels each could occur over a 30 year period from imported petroleum products. Since a total of approximately 96 oil spills greater than 1,000 barrels each could occur when all resources are considered (assuming OCS transporation spills substitute for an equal number of imports), the probability of one or more spills occuring and degrading offshore water quality would be very high. From the projected number of 633 exploratory wells, a total of 6,330,000 to 18,990,000 barrels of muds and 1,899,000 to 3,798,000 barrels of cuttings could be discharged throughout the planning area. Sewage sludge and industrial waste dumpsites will contribute to the degradation of offshore water quality in the region. Installation of one oil and five gas pipelines would increase the amount of turbidity in the water column. Impacts related to pipeline accidents, such as gas blowouts or oil leakages, could increase. Therefore, the total cumulative effect of OCS and non-OCS related activities could result in a moderate decline in offshore water quality, particularly in the vicinity of drilling rigs and ocean dumpsites.

Under the proposal, 6 oil spills (1 from production and 5 from transporation) over 1000 barrels each may occur and. 3 pipelines (1 oil and 2 gas) are projected. this indicates that the proposal contributes significantly (38%) to the total number of estimated OCS spills, but not significantly (1%) to the total number of OCS imported spills combined. Also under the proposal, 50% of the total number of projected pipelines will be constructed. Assuming 134 exploratory wells, a range of 1,340,000 to 4,020,000 barrels of muds and 402,000 to 804,000 barrels of cuttings could be discharged throughout the planning area. This volume of drill muds and cuttings is equivalent to about 21% of the cumulative OCS volume of discharged materials. Therefore, the proposal is expected to make a significant contribution to the anticipated cumulative impacts on offshore water quality from OCS development. However, in comparison to the total cumulative case (present and future OCS and non-OCS activities), the proposal does not contribute significantly to the degradation of offshore water quality expected under the total case. When the proposal is contrasted with existing OCS development and non-OCS activities only, it still does not contribute significantly to the degradation of offshore water quality.

(2) Onshore Water Quality and Supply

Onshore Water Quality: Impacts to onshore water quality would be associated with the construction and operation of onshore facilities related to OCS resource exploration and development, particularly gas processing plants. Construction activities for operations support bases, gas processing plants, access roads, pipecoating facilities, etc. would cause nonpoint source increases in surface runoff to nearby streams. Increases beyond usual levels would be temporary, and the severity of any effects would depend on local soil and climate conditions.

Although nonpoint pollution sources cannot be easily controlled, point source discharges would be subject to treatment by municipal and industrial facilities in compliance with Federal and State discharge permit requirements. Those economic activities responsible for the generation of most waterborne discharges, however, would not be substantisally affected by any of the alternatives under this plan. Discharges directly related to facilities connected to OCS development would not have widespread adverse impacts on onshore water quality. Gas processing plants generate 85% of their water from cooling water and 10% from boiler feed. The former may contain sulfuric acid, chromium, zinc and chlorine while the later may contain phosphates and sulfite. Dissolved hydrocarbons may be present in either. The technology exists, however to reduce water quality impacts to acceptable levels as detemined by permitting requirements.

Conclusions. Onshore water pollution impacts are estimated to be small and localized within areas where gas processing plants would be sited.

Onshore Water Supply: Water demand for OCS exploration and development operations falls into 3 categories: drilling water, offshore platform potable water, and onshore service base potable water. Drilling water is that used for the production of drilling muds. Each exploration well could be expected to use 3,260 gpd of water, each development well 2,650 gpd, and each workover well (a production well in operation for some time and requiring remedial work or maintenance) 1,510 gpd. Offshore platform potable water would amount to about 1,260 gpd, while the amount the water required by the service base itself would

vary depending on the size of the base, with an estimated figure of about 200 gallons per employee per day (Middlesex Co. Planning Board, 1979).

Water requirements for a gas processing plant would vary widely depending on the volume of gas processed and the type of cooling system used. Any demands can be satisfied through industrial surface-water supply sources which would not affect potable water supplies. Once-through cooling systems use large amounts of water (fresh or brackish) and would not be used where water supply is a problem. Cooling towers use about .0015 gallons per cubic foot of gas processed, and closed cooling systems consume no significant amount of water. The type of cooling system used would depend upon its overall feasibility in light of local water supply restrictions. Generally, within any region it is expected that appropriately designed and sited OCS-related facilities would cause only a minimal to moderate demand on local water supply. In both New Castle County, Delaware, and Bristol County, Massachusetts, the potential locations for gas processing plants, water supply is abundant, although usage may be regulated. Also, the potential exists for developing large additional sources in the future.

Conclusions. Impacts to onshore water quality and supply under this proposal would be low because local supplies could be stressed only for short periods.

Cumulative Impacts. In the unlikely event that all tracts offshore the North Atlantic are leased and developed during the life of the proposal, water quality impacts will occur due to the construction and operation of onshore facilities related to total OCS resource exploration and development, particularly the four gas processing plants. Discharges from onshore facilities would be minimal and therefore, impacts on water quality will be low. Water supply impacts are also associated with exploration and development needs and gas processing plant requirements. Although most areas where facilities are proposed to be located have abundant water supplies, industrial supply for the New Jersey area, which is heavily dependent on surface water sources, is already reaching maximum development capacity due to large demands by competing users.

In addition to the impacts on water quality and supply associated with total OCS development, numerous other projects such as the proposed New England Energy Park in Bristol County, Massachusetts, pipeline proposals, coal export facility proposals, and various waterfront projects, will place demands on water supplies and impact water quality. Though exact demands generated by non-OCS projects are not available, the number, size and nature of these facilities implies significantly greater demands than those associated with total OCS development. The cumulative effect of all impact-producing agents is expected to be moderate.

The proposal represents one of many impact-producing agents and as such represents a small portion of cumulative impacts to water quality and supply. This is true whether all hydrocarbon resources are leased and developed or only prior leases and the proposal are developed.

c) Navigation: The leasing of offshore areas for oil and gas exploration and development can be expected to result in the placement of offshore structures as well as an increase in vessel traffic. Assuming that holding the North Atlantic sales under the Alternative I schedule results in

the discovery of commercial oil and gas deposits, 28 platforms could be constructed. If such structures are sited in the vicinity of major shipping lanes, or in the Separation Zones between lanes or in a route leading to a port, there would be an increased probability of vessels colliding with these structures as well as with other vessels. Possible consequences of such mishaps include oil spillage, loss of life, release of debris and damage to vessels and structures.

Areas within the Delaware Bay and Chesapeake Bay Traffic Separation Schemes (TSS) have some potential of containing geologically prospective acreage. If leased, structures would not be allowed within the traffic lanes of the TSS's but could be sited within the separation zones.

In a computer simulated study of vessel movements around offshore structures in the Santa Barbara channel it was found that, when structures were placed near the border of a traffic lane, vessel commanders often performed evasive actions which increased the risk of collision with other vessels. The risk was exacerbated when structures were located on both sides of a traffic lane. The occurrence of such evasive maneuvers was considerably decreased by the placement of structures outside a 500 meter buffer zone on either side of the Traffic Separation Scheme (TSS) (U.S. Dept. of Commerce, Maritime Administration, 1981).

In a study carried out by the Transportation Systems Center, it was found that 78 percent of all tank vessel casualties in U.S. waters involving rammings, collisions and groundings took place at night or during period of reduced visibility (U.S. Dept. of Commerce, Maritime Administration, 1981). In the North Atlantic visibility reduction due to fog is most prevalent during May, June and July. During this period fog and haze may reduce visibility to less than 2 miles 25 percent of the time. While reduced visibility has the potential of increasing the number of collisions between vessels and offshore structures, rigs and platforms could also provide a benefit for safe navigation due to Coast Guard mandated navigational aids.

Impacts to navigation resulting from vessels involved in pipelaying activities will be limited to the time necessary to trench and lay the pipelines. Pipeline landfalls assumed in Alternative I-1 would be located at Atlantic City, New Jersey; Little Compton, Rhode Island and Bethany Beach, Delaware. Vessels involved in trenching and pipelaying activities include lay barges, tugboats and supply boats. The Coast Guard will advise vessels of the exact time and location of such operations. Oil discovered in the northern portion of the planning area could be tankered from single point moorings to refineries in the New York or Philadelphia areas. Because it is assumed that OCS oil will replace foreign oil, overall tanker traffic in the shipping lanes leading to New York and Philadelphia should not increase.

Increased vessel traffic resulting from Alternative I-1 Sales would be primarily in the form of supply boats necessary to service the offshore structures. Approximately 65 supply boats would be required to service the 28 platforms assumed to result form Alternative I-1 Sales. Based on current experience with supply vessels operating out of the Davisville, RI, service base, these 65 vessels can be expected to complete roughly 7,800 round trips per year. It should be emphasized, however, that these trips will not all be made from the same port but will be divided among the assumed service bases.

Assumed service base locations are at Davisville, Rhode Island; Wilmington, Delaware and Hampton Roads, Virginia. Because the supply vessels would utilize existing TSS's present at the approaches to all three bases, their presence in nearshore waters should not create an increased hazard to navigation. Once outside established TSS's, measures described below should lessen any hazard these vessels might conceivably present.

Existing measures to mitigate adverse impacts to navigation include: 1) OCS Operating Order No. 1, which covers the identification of wells, platforms, structures, mobile drilling units, amd subsea objects; 2) the requirement to obtain a permit from the Army Corps of Engineers for an offshore structure having an impact on navigation; 3) the requirement to obtain a permit from the Coast Guard for lights and fog signals on offshore structures to prevent their being a hazard to marine navigation; and 4) the Coast Guard's authority to establish safety zones around structures for the purposes of navigational safety.

Conclusions. The impacts on vessel traffic resulting from the proposal would be high because tracts within Traffic Separation Schemes could be leased, and overall, this is a high vessel traffic area.

Cumulative Impacts. In the unlikely event that all tracts offshore the North Atlantic are leased and developed during the life of the proposal, it is estimated that 633 exploratory and delineation wells, 98 platforms, and 2,443 development and production wells will result. Some of the temporary or permanent structures needed for dilling may be sited within the separation zones within the Delaware Bay and Chesapeake Bay Traffic Separation Schemes (TSS), thus contributing to vessel conflicts. More than 200 supply boats, making roughly 25,000 round trips per year, could be required to service this level of activity.

Existing ports and harbors will continue to handle the high volume of vessel traffic currently supported by the area. Projects such as the revitalization of some waterfront areas and the proposed East Coast deepwater ports, if constructed, could add to impacts on navigation, though such incrases would be low relative to existing traffic. The cumulative effect of these activities is expected to result in high impacts to navigation and shipping.

Since the vessel activity and structure placement associated with the proposal represents a small percentage of all activities that may impact navigation and shipping, the contribution of the proposal to cumulative impact will be moderate. This is true whether all hydrocarbon resources are leased and developed or only prior leases and the proposal are developed.

d) Other Uses of the OCS

(1) Military and NASA Activities: Potential use conflicts exist between OCS oil and gas activities and military and NASA operations. Specific area coordination has not yet taken place with DOD. It will take place on a sale-by-sale basis.

A substantial portion of the water and air space within the North Atlantic planning area is used for various military operations. These include training and testing activities such as submarine operations, gunnery practice, sea

trials, radar tracking, and vessel maneuvers, all of which take place within specific operating areas under the purview of the Department of Defense.

Several operating areas are partly or totally within the planning area. The controlling authority of each operating area is responsible for ensuring that DOD activities are coordinated with OCS oil and gas operations. The Boston Operating Area's controlling authority is Commander, Submarine Squadron Two, Naval Submarine Base, Groton, Connecticut. The controlling authority for the Narragansett Bay, Atlantic City, Pautuxent River, and Virginia Capes Operating Areas is Commanding Officer, Fleet Area Control and Surveillance Facility, Virginia Capes Naval Air Station, Ocean, Virginia. Within these areas, the Navy conducts operations essential to training, readiness, and support of national defense and security interests. Air Force warning area (W-506), a training area for high speed aircraft operating out of various New England bases, is managed by the 21st Air Division, Hancock Field, New York.

Drilling operations in certain locations could interfere with submerged navigation. Other possible use conflicts between OCS oil and gas and DOD training activities exist. Most of these traditionally have been mitigated through coordination between the lessee and the appropriate military authority.

Wallops Flight Center, Virginia, is an installation from which NASA launches rockets. OCS activities within areas adjacent to the Wallops Flight Center could be restricted. However, for most nearby areas, coordination of activities is sufficient to mitigate the use conflicts.

<u>Conclusions</u>. Use conflicts between military and NASA operations and OCS oil and gas activities will be moderate.

<u>Cumulative Impacts</u>. A moderate level of conflict between the DOD and NASA and OCS development is anticipated in the unlikely event of full development of OCS oil and gas resources in the North Atlantic region. The total OCS development scenario for all the resources in the region predicts 98 production platforms and 633 exploratory wells. Under the proposal, 28 production platforms and 134 exploratory wells are anticipated. The contribution of the proposal is considered to be a substantial portion of the cumulative impacts. The activity associated with this proposal's potential development expecially platform installation and location of drilling vessels, as well as the support vessels/helicopters servicing them, will preclude or restrict military operations in specific areas for the life of the development, adding moderately to the cumulative impacts on DOD and NASA activities.

(2) Ocean Dumping: Active dumpsites within the North Atlantic Planning Region include: a sewage sludge dumpsite; one acid wastes dumpsite the 106-mile industrial wastes dumpsite; a cellar dirt dumpsite; a wood incineration site; and 14 dredged material dumpsites, including the "mud dump" site. Although the dumpsite for wrecks is still formally designated for that purpose, it is currently inoperative. Eight former explosives dumpsites and five sites where radioactive wastes have been dumped are also located within or adjacent to the planning area. Coordinates on record for these dumpsites, however are regarded as only approximate locations of dumped materials. In January 1981, the EOA proposed the designation of a toxic waste incineration site, located within the vicinity of the 106-mile dumpsite.

Presently-active ocean dumpsites are located only within the Mid-Atlantic portion of the North Atlantic Planning Unit.

For blocks which lie within these dumpsites there is a potential for use conflicts between oil and gas activities and ocean dumping. There is also the potential for interactions (synergistic effects) of discharges from rigs and platforms with ocean-dumped wastes. Any potential use conflicts or harmful synergistic effects, however, can be mitigated through coordination of OCS operations and dumping activities with EPA for those blocks which overlap the dumpsites and a buffer zone around the blocks.

Synergistic impacts are not likely to occur from the dumping of wastes and drilling discharges in the blocks within the dumpsites and in the surrounding blocks. In order for the wastes to interact, dumping would have to occur simultaneously and in very close proximity. It is possible that if this were to occur the materials could form other compounds, the nature of which would depend on the waste components. For example, clays present in drilling muds could provide sites for the attachment of substances present in the dumped wastes, such as heavy metals, and carry them to the bottom as they settle out (USEPA, 1980).

Wastes presently dumped at these sites, however are in liquid form and have been shown to disperse rapidly in the upper water column. Even flocculated sewage materials have been observed to disperse in the upper column. Studies conducted by NOAA on these wastes, some of wich contain materials that are present in drilling muds have not been able to demonstrate severe or permanent synergistic effects with other compunds present in the water column (USEPA, 1980).

Conclusions. Impacts on ocean dumping would be moderate due to oil and gas operations posing some conflicts with dumping activites.

Cumulative Impacts. A moderate level of conflict between ocean dumping and OCS development is anticipated in the unlikely event of full development of OCS oil and gas resources in the North Atlantic region. The total OCS development scenario for all the resources in the region predicts 98 production platforms, 6 pipelines, and 633 exploratory wells. Under the proposal, 28 production platforms, 3 pipelines, and 134 exploratory wells are anticipated. Since OCS structures and in some cases rig discharges, can be an impact producing factor on dump sites, the proposal will contribute significantly to the cumulative impacts. If only OCS development described under the proposal occurs, as opposed to the total development case, the conflict potential should remain at a moderate level due to the large size and water depths of most active dumpsites.

e) Impacts on Land Use: Under this alternative, and based on analysis prepared for prior lease sale EIS's, the following OCS facilities could be required: two gas processing plants (Bristol County, MA and New Castle County, DE), one oil pipeline (Atlantic City, NJ landfall) and two gas pipelines (Little Compton, RI and Bethany Beach, DE). Support base facilities would also be sited in Davisville, RI, Wilmington, DE, and Hampton Roads, VA. General existing land use in these areas is given below and the levels of impacts for each of these facilities is summarized in Table I. The most

significant users of land (and most prone to conflicts) are gas processing plants.

FACILITY	GENERAL EXISTING LAND USE
Oil pipeline-Atlantic City, NJ	Recreational beach, urbanized area inland
Gas pipelines	
Little Compton, RI	Recreational beach, use of highway ROW inland
Bethany Beach, DE	Recreational beach, rural/farm area inland
Gas Processing plants	
Bristol Co., MA	Site of proposed New England Energy Park, zoned for heavy industry
New Castle Co., DE	Varied land uses predominate. Industrially zoned land would be required
Support bases	
Davisville, RI	Facility already used as support base, 450 acres are available for OCS development
Hampton Roads, VA	Zoned for light industrial use. Has 3 cargo piers available
Wilmington, DE	Port/shipping area exists. Zoned for industrial use

Other OCS related facilities (such as pipecoating yards, platform fabrication and marine terminals) would either be 1) outside the region, 2) already existing, or 3) constructed as a result of previous OCS sales.

Conclusions. Impacts on land use will be low for all OCS related facilities other than gas processing plants which would cause moderate impacts.

Cumulative Impacts. In the unlikely event that all tracts offshore the North Atlantic are leased and developed during the life of the proposal, five pipeline rights-of-ways, four gas facility sites, and four support base sites may be required. In addition to OCS-related land use, numerous other projectes such as the proposed New England Energy Park in Bristol County, Massachusetts, pipeline proposals, coal export facility proposals, and various waterfront projects will place land demands as well. Though exact demands generated by non-OCS projects are not available, the number, size and nature of these facilities implies significantly greater demands than those associated with total OCS development.

Due to the diverse nature of the region, the industrial decline of certain areas, and availability of existing industrially zoned parcels, much development may be accommodated and the cumulative impact of these projects is expected to be low to moderate.

The proposal represents one of many potential land uses and as such represents only a small percentage of regional development. Since non-OCS-related projects are more prevalent than OCS, the contribution of the proposal to cumulative impacts is low whether all hydrocarbon resources are leased and developed or only prior leases and the proposal are developed.

f) Impacts on Cultural Resources: Assuming that holding the North Atlantic sales under this Alternative results in the discovery of commercial oil and associated gas deposits, 28 offshore platforms and 3 pipelines could be constructed. Impacts on cultural resources may be both positive and negative in nature. Seismic surveying and bottom sampling during the geophysical evaluation phase may result in the identification of previously unknown sites, thus providing a benefit to archeological research. On the other hand, bottom sampling could also result in the disturbance of unknown buried resources. During the exploration and development phases, rig, platform and pipeline installation could disturb both surface and buried resources. Drill cuttings, muds and fluids ahve the potential for damaging sites by means of chemical interaction but could also afford protection through site burial.

Areas with the highest probability of containing submerged shipwreaks and archeological artifacts are ancestral river valleys such as those of the Susquehanna, Delaware and Hudson, and nearshore regions. Because these areas are well removed from the most geologically favorable acreage, the possibility of conflict is low. The chance of an oilspill reaching the shoreline from such a great distance and contacting onshore cultural resources is similarly low. Of the three pipelines assumed to be needed to transport the oil and gas, shell middens, black earth middens, villages and fishing camps are types of sites which could be impacted by the Atlantic City oil pipeline; and shell middens, black earth middens and villages by the Bethany Beach gas pipeline (Institute for Conservation Archaeology, 1979). Impacts which could result from these pipelines include site discovery and disturbance of buried resources. In the case of the oil pipeline, site damage caused by oil leakage during the production phase could also result.

Onshore cultural resources include historic buildings, structures, sites, and districts as well as archeological sites. Absecon Lighthouse in Atlantic County, NJ is an example of a National Register of Historic Places site located in the general vicinity of a pipeline landfall identified in this analysis. Absecon Lighthouse, and any other historic site listed on the National Register, however, is afforded protection under the National Historic Preservation Act of 1966, as amended and therefore will not be impacted by OCS activities. Because the majority of historic structures in the immediate tidal zone are protected by bulwarks or other barriers, damage from an oilspill would be largely aesthetic in nature. Cultural resources buried below the mean high tidal level, however, could be severely damaged or destroyed by an oilspill.

Conclusions. The level of impacts on cultural resources under the proposal is low.

Cumulative Impacts. In the unlikely event that all tracts are leased an developed during the life of the proposal, three more pipelines would be required in addition to those described in Alternative I-1. Of these three, fishing camps, shell middens, black earth middens and villages are types of sites which could be impacted by the Virginia Beach gas pipeline and shell

middens, black earth middens and villages by the Sea Girt gas pipeline. The third pipeline is an additional one at Little Compton from which impacts on cultural resources are not expected.

Although the number of platforms would increase by seventy, it is very likely that most, if not all, of them would be located well offshroe. Any onshore facilities likely to result would probably be located in industrially zoned areas, thus lessening the possibility of impacts on cultural resources. Since the majority of historical structures in the immediate tidal zone are protected by bulwarks or other barriers, damage from an oilspill would be largely aesthetic in nature. Cultural resources buried below the mean high tide level could be severly damaged or destroyed by an oilspill. In addition to OCS-related impact producting factors, other projects exist which may disturb the cultural resource base of the region. Examples of these are dredging activities, port and harbor developments, and East Coast deepwater ports, if constructed. Terrestrial cultural resources may be reduced by any of numerous onshore development projects. The cumulative effect of all these activities is expected to result in low impacts on cultural resources.

Since most of the offshore activity associated with the proposal will be located well offshore, and onshore developments are minor relative to total onshore development over the life of the proposal, the contribution of the proposal to cumulative impacts is low. This is true whether all hydrocarbon resources are leased and developed, or only prior leases and the proposal are developed.

2) Impacts of Special Concern

a) Impacts on Commercial Fisheries: The New England seaboard States (Maine, New Hampshire, Massachusetts, Rhode Island, and Connecticut) have commercial fisheries (inshore as well as offshore) whose combined landings by volume rank as the third most important in the U.S. (NMFS, 1981). The Georges Bank region, encompassing approximately 70,000 km2, produces as annual harvest of 25.6 thousand/lbs/km2 (OCZM, 1980). In 1979, over 30.2 million pounds of finfish and shellfish were harvested from Georges Bank by New England fishing vessels; this catch was valued in excess of $121 million (NMFS, unpublished data). By dollar value, the most important fisheries in New England in 1979 included lobster, sea scallops, cod, haddock, yellowtail, seadab, blackback, sea herring, soft and hard clams.

The commercial fisheries in the southern portion of area extend from Cape Hatteras, North Carolina north to Montauk Point, NY. The value of landings in the area increased form 40 to 92 million dollars in 1979. United States fishermen predominate in the catching of flounder, scup, silver hake, menhaden, striped bass, tilefish, scallop, clams and lobster.

The impact on commercial fisheries will primarily come from oilspills, drill muds and cuttings, formation waters, and spatial exclusion due to the placement of rigs, platforms, and pipeline. Under Alternative I-1, 134 delineation wells, 698 development wells and 29 production platforms are expected. An oil pipeline is expected to landfall at Atlantic City, New Jersey with gas pipelines to Little Compton, RI and Bethany Beach, DE. All of these to a limited extent will exclude space from commercial fishing activities. Trawls and dredges are dragged over large areas of the seafloor, and can encounter and

become fouled on natural or man-made bottom obstructions. Submerged oilfield obstructions include pipelines, subsea completions, and debris that is lost overboard from platforms, rigs or workboats. Rigs and platforms are generally avoided by fishermen. The cost to a fishermen can be substantial from a fouled trawl or dredge. The losses can range from a small time loss required to free the gear to considereable losses of downtime for repairs, replacement of gear, and missed catch.

In addition to normal legal channels, special mitigation is available for fishermen who suffer gear and associated losses on the OCS. The Fishermen's Contingency Fund, Title IV of the OCS Lands Act of 1978, provides for establishment of a fund to compensate fishermen for losses sustained on the OCS because of oil and gas activities. This Act applies to losses that cannot be attributed to a financially responsibile party. Under the Act, the Department of Commerce is charged with mapping both man-made and natural obstructions on the OCS and making the information available to fishermen. In view of the mitigation available, the increased gear conflict and associated losses should be largely compensated.

The greatest impacts to commercial fisheries will primarily come from both acute and chronic oilspills. Nelson-Smith (1972) suggested that actively swimming species are able to avoid contamination since significant fish kills have not been observed following offshore oilspills. Based on these avoidance reactions, mortality of adult fin fish is not expected to be significant, but impacts on eggs and larvae could have an important effect on the commercial fisheries, particularly over Georges Bank. The spawning areas of the predominant species in the Mid-Atlantic are extremely general and not well defined as is the case with the Georges Bank area. The suggested recirculation over the shallowest parts Georges Bank at 10 to 20 meters appear capable of retaining larvae within the shelf environment during their critical pelagic stages. The occurrence of strong year classes in fish stocks indicates that physical and biological processes, such as current variability, food supply, and predators, for example, also play important roles in the survival of fish larvae on Georges Bank. BLM is currently funding a study (Assessing the Impacts of oilspills on a Commercial Fishery) to quantify the impacts of oilspills on selected fish populations on Georges Bank and to evaluate the economic loss due to oilspills. The preliminary results imply that oilspills will not cause massive losses to the fisheries. Nevertheless, long term effects could be very different if an oilspill coincides with a poor year class due to unfavorable natural conditions for larval development and survival.

Nearshore: Hard clam grounds are found primarily within an area extending from Cape Cod, Massachusetts to Cape Hatteras, North Carolina. The industry is centered in the Great South Bay on Long Island, and Narragansett Bay, Rhode Island. An oilspill could be moved by tidal action through Fire Island Inlet, but oil containment equipment is stored in the immediate vicinity. The possibility of impacting this important commercial and recreational resource can be significantly reduced inshore through the proper use of oilspill containment equipment. Many of the most productive hard clam grounds in Narragansett Bay have been closed due to pollution. This species is essentially estuarine inhibiting shallow bays and coves along the Rhode Island coat. The sediments were contaminated ue to an oilspill, recruitment to the hard clam populations would be affected for up to 10 years or more with commercial clamming activities curtailed.

The most important populations of bay scallops occur from Cape Cod to Barnegat Bay, New Jersey. The most valuable fishing grounds are in the New York waters; principally Gardiners, Peconic and adjoining bays. The probability of an oilspill occurring and impacting these areas is low but contamination could remain for ten years or more and affect recruitment because of the isolation of the breeding stock, curtailing any recreational or commercial activities. Large populations of bay scallops and smaller ones of hard clams are found in the shoal areas adjacent to Nantucket Island and Martha's Vineyard. These populations would be susceptible to an oilspill but would be expected to recover. Contaminated sediment could affect recruitment of bay scallops for up to 10 years or more. Remuneration of this economic loss would be available under title III-Offshore Oilspill Pollution Fund (OCS Lands Act Amendments of 1978). The most significant quantities of blue crabs occur along the Mid-Atlantic coast near Delmarva Peninsula and within and at the mouth of the Chesapeake Bay. An oilspill would be especially harmful during the winter and could kill overwintering females or during the summer when larvae could be impacted. Either possibility would probably result in a year class failure which could seriously impact the commercial fishery. Inshore lobster can be found throughout the New England coastal waters. However, fishing pressure and pollution have greatly reduced the local populations (Beccasio, 1980). If sediment contamination does occur, lobsters, being scavengers would have a reduced food supply and tainting could occur from feeding on contaminated organic matter. Sediment contamination from an oilspill could affect the local lobster population for up to 10 years or more. This would require inshore lobstermen to move their ports to other areas and increase fishing pressure on other local populations already under intense fishing pressure.

Drilling Activities: Drill cuttings could accumulate beneath each platform but would be expected to be confined to a localized area around the platform. The finer materials, composed mostly of drill muds with some pulverized cuttings, would initially be suspended in the water column, thus contributing to turbidity. The configuration of the plume from these cuttings would be dependent upon prevailing tides, currents and winds. Because the size of the plume from an individual rig would be expected to be small there should be little impact upon the commercial fisheries. Larval organisms are generally more sensitive to the chemical constituents of drilling fluids than are juvenile and adult stages. Gerber et. al. (1980) showed that the larvae of northern shrimp and lobster are more sensitive than that of adults. This mortality was observed during 96 hour static bioassays using concerntrations of whole mud or fractions that would occur only near the point of discharge. It was concluded that toxic effects to meroplankton will be unlikely given the depth of the discharge and rapid dilution of the effluent.

In areas with relatively moderate currents, fish congregating around a drilling platform could experience some degree of sublethal stress unless they actively avoid the plume. On Georges Bank, the highly energetic environment will rapidly disperse the plume within 100 meters, making it very unlikely that any fish will remain in the plume for a significant period of time.

Menzie et. at. observed that seasile bottom fauna in the vicining (150m) of a drill rig in the Baltimore Canyon were buried by patches of drill cuttings while simultaneously there occurred increased numbers of hake and crabs in the area. This effect was considered temporary in that the clay deposits are expected to be reworked by currents. Hake are bottom feeders and are not

expected to suffer any sublethal stress from the plume. Hake and crabs were attracted to the pile of drill cuttings which temporarily accumulated beneath the rig. It is possible that the initial concentration of discharge could cause some mortalities of larval crustaceans (lobster, crabs), if they enter the plume at a highly sensitive stage of molting. Carls and Rice (1981) reported that the most evident immediate response of larval crustaceans upon exposure to high concentrations for at least four hours. Sensitivity of fish eggs and larvae to drilling fluids have not been reported in the literature, but is likely to be no greater than those of the most sensitive larval crustaceans, and their exposure would be similarly brief. Significant bioaccumulation of heavy metals in fish is not expected due to the high mobility of fish and the nature and duration of the discharges. The exception may be found in populatins of fish that are attracted to and remain in the vicinity of the drilling vessel for a period of several weeks or months. These fish may browse or otherwise feed on rig-fouling organisms that may contain elevated levels of some metals. This would be more likely around a production platform where a number of wells may be drilled over periods of several years. This attraction of fish around a rig was observed in the Baltimore Canyon (Menzie et. al., 1980). Twenty-eight platforms are estimated under this alternative. The likelihood of significant impacts on fish from drilling muds and cuttings is remote but the potential exists that some platform associated fish could incorporate some heavy metals into their tissues to a limited extent. Formation waters contain hydrocarbons, dissolved mineral salts, heavy metals, which are much denser than seawater and lack oxygen. Dilution models have indicated that the areal extent of increased hydrocarbon levels around a platform will be 0.1 square miles for concentrations over 10 ppb, and 0.001 square miles for a concentration over 1 ppm (Massachusetts Institute of Technology, 1973). Kunhold (1977) found no noticeable effects on cod larvae at levels of 10 ppb. Hufford (1071) and other reported that crude and bunker oils were toxic to fish eggs in concentrations of 1 ppm. Therefore, impacts to ichtyoplankton would be very localized; approximately 0.001 square miles around the 28 expected production platforms.

Conclusions. Impacts on commercial fisheries under this proposal would be moderate because although the industry may suffer some economic loss, overall, it would not be measurable against the natural variation in fish stocks.

Cumulative Impacts. In the unlikely event that all tracts offshore the North Atlantic are leased and developed over the life of the proposal, a total of 16 spills (3 from production and 13 from transportation) over 1,000 barrels each may occur over the life of the field. As estimated 93 spills greater than 1,000 barrels each could occur over a 30 year period from imported petroleum products. Since a total of approximately 96 oilspills greater than 1,000 barrels each could occur when all resources are considered (assuming OCS transportation spills substitute for an equal number of imports) the probability of one or more spills having a significant adverse effect on commercial fisheries would be moderate to high. Drilling rig and production platform discharges identified under the impacts of Offshore Water Quality section could result in the burial of benthic organisms. An estimated 98 production platforms and 6 OCS pipelines may result in the exclusion of a moderate amount of commercial fishing areas. Sewage sludge and industrial waste dumpsites are also areas that can exclude or adversely affect commercial fishing. Therefore, the total cumulative effect of OCS and non-OCS related

activities could adversely affect and cause a moderate decline in the commercial fishing industry.

Under the proposal, 6 oilspills over 1,000 barrels each may occur, 3 pipelines are projected platforms will be needed to developed the resources. These numbers indicate that the proposal contributes significantly (38 percent) to the total number of estimated OCS spills, but not significantly (1 percent) to the total number of OCS and imported spills combined. Also under the proposal, 50 percent of the total number of projected pipelines and 28 percent of the total number of production platforms will be put into use. About 21 percent of the cumulative volumes of drilling muds and cuttings will be discharged under the proposal. Therefore, the proposal is expected to contribute significantly to the anticipated cumulative impacts on commercial fisheries from OCS development. However, in comparison to the total cumulative case, the contribution of the proposal to cumulative impacts on these fisheries is low whether all OCS resources are leased and developed or only resources described for the proposal are developed.

b) Impacts on Endangered Species

Coastal and onshore endangered species occurring in this planning area include the bald eagle, peregrine falcon, short nose sturgon, and Delmarva peninsula for squirrel (found on Chincoteague Island, VA). Oilspills for the transport of oil to shore (5 greater than 1,000 barrels are estimated) could threaten migrating bald eagles and peregrine galcons. The oil pipeline landfall near Atlantic City, NJ, could disrupt breeding peregrines during construction or could affect breedng success should a pipeline spill occur. Support facilities and gas pipeline landfalls should not adversely affect these species as these facilities are expected to be located in areas of existing development. Some individual species, particularly eagles and falcons, could suffer adverse or lethal effects from contact with an oilspill or oiled prey; but the affect on the total population should be negligible.

Five species of sea turtles including the endangered Atlantic ridley, leatherback, and hawksbill turtles and the threatened green and loggerhead turtles have been known to occur in this region. Only the loggerhead and the leatherback are present in high numbers with the remaining three species perferring shallow nearshore waters or occur only as rare visitors to the region. These turtles could be adversely affected by inhaling or ingesting spilled oil, by feeding on oil contamination prey or prey exposed to chronic rig discharges, and by collisions with service vessels. A total of 28 production platforms will be discharging drill muds and formation waters under this alternative. The long term effect of these discharges on sea turtles are not known. Since a total of 6 oilspills over 1,000 barrels each is estimated to occur over the production life of the field, some sea turtles mortalities could occur. Of all the endangered or threatended sea turtles, only the loggerhead and the leatherback are expected to be exposed to OCS related impacts to any great extent. However, a long-term adverse effect on each species from OCS production and development under this alternative is not anticipated.

Six endangered species of whales including the fin, sei, sperm, blue, humpback and right whales occur in this planning area. Peak numbers of whales are present during the spring, summer, and fall seasons. Jeffreys Ledge and

Stellwagen's Bank in the Gulf of Maine and the nearshore waters east of Cape Cod have been identified as important feeding areas for humpback and right whales and their calves (CETAP, 1981). The sperm whale has been found to concentrate along the 1,000 meter depth contour which is also an area of high oil and gas potential. Oil and gas exploration could expose these whales to several types of adverse impacts including baleen fouling, skin and eye irritation, and inhalation or ingestion of oil should they contact an oilspill. The right, sei, and humpback whales can break and water surface when feeding, making them especially vulnerable to a surface oil slick. If a large spill should occur, it could temporarily contaminate or reduce the available food supply forcing whales to move to possibly less desirable feeding grouds. Exploration and drilling sounds and associated service vessel traffic could alter normal cetacean activities such as feeding behavior and use of migration routes. Service vessel traffic may also pose a limited risk of collision to these whales and to sea turtles. The important feeding areas of the right and humpback whales are unlikely to be exposed to any OCS related oilspills or associated production and development activities if development is concentrated in the more prospective offshore areas. The sperm whale will be exposed to OCS related impacts more frequently than any other whale species due to its prevalence in the most prospective areas. The fin whale is widespread throughout the area and is not known to concentrate in areas of high oil and gas potential. The sei and blue whales are infrequent visitors to the North Atlantic region. The estimated number of oilspills greater than 1,000 barrels (6) may cause some localized adverse effects but should not result in any serious long-term effects to the endangered whales.

Conclusions. Impacts on endangered species resulting from this proposal are low overall, although a small number of turtle mortalities which would not pose a serious threat to each population, could result and impacts on cetaceans are uncertain. Coastal and onshore endangered species are not likely to be seriously affected by OCS activities in the region.

Cumulative Impacts. In the unlikely event that all tracts offshore the North Atlantic are leased and developed over the life of the proposal, a total of 16 spills (3 from production and 13 from transporation) over 1,000 barrels each may occur over the life of the field. An estimated 93 spills greater than 1,000 barrels each could occur over a 30 year period from imported petroleum products. Since a total of approximately 96 oilspills greater than 1,000 barrels each could occur when all resources are considered (assuming OCS transporation spills substitute for an equal number of imports), the probability of one or more spills contacting an endangered species or an important habitat area will be very high.

Based upon this, the marine habitats of both the turtles and whales could experience some habitat degradation. The high number of estimated production platforms (98) could influence normal sea turtle and whale behavior. Sea turtles may be drawn to platforms in search of food, but this may increase the chance of collision with service vessels or their amount of exposure to platform discharges. The sounds from production platforms and their mere physical presence along with associated service vessel traffic, may affect communication or migratory patterns among endangered whales.

Impacts unrelated to OCS oil and gas production and development that will adversely affect many endangered species in the region include the very high

risk of contacting a spill resulting from imported oil (93 spills estimated), the high mortality experienced by sea turtles from some forms of commercial fishing, the loss of some whales from subsistence hunters to the north, and from entanglement in fishing gear and habitat degradation due to ocean dumping. Non-OCS related impacts may have a more serious adverse effect upon endangered species than would OCS related impacts. The cumulative effects of OCS activities and non-related activities could result in the mortalities of some individually endangered birds, turtles, and whales. The long-term effects on their already depleted populations are uncertain, but there may be a further reduction in existing populations.

Under the proposal, 6 oilspills over 1,000 barrels each may occur and 28 production platforms will be needed to develop the resources. These numbers indicate that the proposal contributes significantly (38 percent) to the total number of estimated OCS spills, but not significantly (1 percent) to the total number of OCS and imported spills combined. Also under the proposal, 28 percent of the total number of production platforms will be put into use. About 21 percent of the cumulative volume of drill muds and cuttings will be discharged under the proposal. Therefore, the proposal is expected to contributesignificantly to the anticipated cumulative impacts on endangered species from OCS development. Since the non-OCS-related impacts may have a more serious adverse effect upon endangered species than would OCS related impacts, the contribution of the proposal to the total cumulative impacts is not as serious a threat whether all resources are leased and developed or only the resources described for the proposal are developed.

c) Habitats and Resources of Special Concern

Sensitive nearshore areas including nursery grounds, estuaries, and bays have been discussed under Impacts on Coastal Ecosystems.

There are two areas in the North Atlatnic Planning Area which previously have been considered to be sensitive to oil and gas development. The first one includes the shallower waters on Georges Bank and the second on the offshore canyon heads along the southern flank of the Bank.

Georges Bank and the adjacent Nantucket Shoals region supports a major commercial fishery. The larvae of all species and the eggs of all species except herring drift passively in the neutrally buoyant stage for a period of one to possibly five months after spawning (Colton and Temple, 1961). Previous investigations have suggested that the clockwise circulation on Georges Bank would minimize the advection of eggs and larvae away from the central portion of the Bank and this partially accounts for the high productivity of the region. However, Colton and Temple (1961) recognized that the off Bank near-surface drift should carry eggs and larvae, thought to be concentrated in the upper 10 to 15 m off the Bank. More recent studies of the larval distribution suggest that the larvae are distributed throughout the water column (Lough and Cohen, unpublshed data, 1980). Although the surface flow along the southern flank may have an off-Bank component, the data presented by Butman (1981) indicated that the mean currents at this depth are more closely aligned with the topography of the Bank. Thus, although the planktonic eggs and larvae in the surface layer may be advected away from the Bank, especially in winter, those below 10-20 meters may recirculate around the shallowest

portions until they enter adult stages. Cross bank exchange associated with the strong tidal and/or the low frequence currents, and major episodic advection events such as storms and Gulf Stream rings will also influence the length of time passive organisms remain in the Georges Bank region.

The proposed schedule could involve areas on the continental slope, including some located in and near submarine canyons. Canyons are prominent features of the eastern continental margin north of Cape Hatteras, North Carolina, and exploration for oil and gas in these areas may introduce environmental considerations unlike those on the continental shelf and inter-canyon areas. Biological considerations are primarily twofold. First, various bottom species - notably lobster and tilefish and heavily fished in canyon areas, and interest focuses on possible impairment of the biological resource base or interference with its exploitation. Second, canyons have been identified as habitats for various deep-sea anthozoans (e.g. soft corals) and other forms requireing hard substrates and relatively strong bottom currents to survive. Canyon heads are recognized as erosional or non-depositional areas in contrast with the depositional nature of lower portions of the inter-canyon slope and areas of canyons below the mudline. Winnowing of fine sediments by the relatively high-energy currents in the canyon heads helps to keep these habitats clear of detritus. the canyons of the Georges Bank region are believed ot be more active in terms of erosional processes than canyons in the Mid-Atlantic. The more depositional characteristics of the Mid-Atlantic canyons make them more comparable to the inter-canyon regions of the area.

The aggregation of lobster and red crab in canyon heads has attracted the attention of fishermen. Valentine <u>et</u>. <u>al</u>. (1980) indicated that in the late 1960;s the offshore trawl fishery for lobsters was supplanted by trap-fishing that rapidly expanded into canyon heads and other areas to depth of 300 m. Later, trap strings were set in progressively deeper waters (greater than 500 m) to catch red crab. Tilefish are taken by long-lines set on the bottom, primarily in depths of 100 to 200 m. The northern grounds account for approxmiately 96 percent of the catch in the Atlantic. Lobsters and red crabs are fished in both canyon and non-canyon areas while tilefish are predominantly fished in canyon heads. These resources are heavily exploited in canyon areas, particularly off Georges Bank.

Under Alternative I-1, 134 exploration wells and 698 development wells are expected to be drilled. For the North Atlantic Planning Unit 6,200 bbls/well of drilling mud and 1,140 cu. yds/well of drill cuttings are expected to be discharged. If extensive drilling occurs in the Georges Bank area, there is a possibility that drilling fluids could ultimately be concentrated within the 60 m isobath and have an effect on the fish eggs and larvae which are retained in this area.

Drilling muds are less likely to accumulate in canyon head areas than elsewhere on the slope or rise. They are less likely to accumulate in the more active canyons of the Georges Bank region, although exceptions exist which may include whole canyon systems or localized areas within particular canyons. Insofar as the biological resources and habitats of interests in canyons are primarily associated with the non-depositional areas, the possible accumulation within certain canyons of discharged materials would appear to be of no more concern than accumulations at equivalent depths on the slope. Monitoring studies

underway in the Georges Bank area, which includes stations in the canyon heads, will provide additional information relevant to these issues.

On Georges Bank, vertical mixing within the 60 meter isobath could drive oil into the sediments, due to wave action in the shallow area. If the oil sinks or is driven into the sediments by wave turbulence the impact on the benthos could be severe. Also the semi-enclosed current system within this area could lead to retention of oil, and impact on sensitive fish eggs and larvae which can be retained by the current system in the area. Impacts would not be limited to the initially affected area since oil sediments can be resuspended and transported by bottom currents. Sediment movement could transport the oiled sediments near lobster and tilefish areas in the canyon heads and have a long-term impact on the commercial fisheries for these species.

Conclusions. Overall, the impacts on habitats and resource of special concern in the North Atlantic from this proposal are expected to be moderate, although impacts to lobster and tilefish in canyons or fish eggs and larvae on the shallow areas of Georges Bank could be moderate to high.

Cumulative Impacts. In the unlikely event that all tracts offshore the North Atlantic area leased and developed over the life of the proposal, a total of 16 spills (3 from production and 13 from transportation) over 1,000 barrels each may occur over the life of the field. An estimated 93 spills greater than 1,000 barrels each could occur over a 30 year period from imported petroleum products. Since a total of approximately 96 oilspills greater than 1,000 barrels each could occur when all resources are considered (assuming OCS transportation spills substitute for an equal number of imports), the probability of one or more spills contacting sensitive habitat areas such as submarine canyons or the shallower waters on Georges Bank would be high. Oil spills would have a minimal impact on submarine canyons but could have a detectable impact on seabird and fishery resources that use the shallower waters on Georges Bank. Under the cumulative case, 633 delineation wells and 2,443 development wells are expected over the life of the fields. The discharging of drill muds and cuttings and formation waters from offshore structures could smother benthic organisms and kill marine larvae.

Therefore, the total cumulative effect of OCS and non-OCS related activites will be an overall decline in the quality of marine habitats and resources of special concern, particularly in the vicinity of OCS structures.

Under the proposal, 6 oilspills (1 from production and 5 from transportation) over 1,000 barrels each may occur and 3 pipelines (1 oil and 2 gas) are projected. This indicates that the proposal contributes significantly (38 percent) to the total number of estimated OCS spills, but not significantly (1 percent) to the total number of OCS and imported spills combined. Under the proposal, 28 percent of the total number of production platforms will be put into use. About 21 percent of the cumulative volume of drilling muds and cuttings will be discharged under the proposal. Therefore, the proposal is expected to contribute significantly to the anticipated cumulative impacts on marine habitats and resources of special concern from OCS development. However, in comparison to the total cumulative case, the contribution of the proposal to cummulative impacts on these marine resources is moderate to low whether all OCS resources are leased and developed or only resources discribed for the proposal are developed.

d) Air Quality: A discussion of the primary factors used in assessing onshore air quality impacts which may result from OCS-related activities and the method employed in quantifying the impact on this planning area are described in Section V.A.3 of this document.

Information on nonattainment areas in the North Atlantic planning area is provided in Table V.D.1.a.2)d)-1.

Table V.D.1.a.2)d)-1.
(Nonattainment Areas in the North Atlantic Planning Area)

State	Area	Nonattainment Pollutants
Massachusetts	Statewide	O_3
	Boston	CO
Maine	AQCR 107	SO_2, O_3, CO
	AQCR 109	CO
	AQCR 110	O_3
Connecticut	AQCR 41	O_3
	AQCR 42, 43	TSP, O_3, CO
Rhode Island	Providence	TSP, CO
	AQCR 120	O_3
New York	New York Metro.	TSP, CO, O_3
New Jersey	New York Metro.	TSP, CO, O_3
	New Jersey Interstate AQCR	TSP, CO, O_3
Delaware	New Castle Co.	O_3
Virginia	Hampton Roads Interstate AQCR	O_3

It was estimated that OCS facilities located within 20 miles of the North Atlantic planning area coast would require emission controls. The most probable location of the resources offshore the North Atlantic and thus the location of platforms is beyond 20 miles from shore. Therefore, the platforms are not expected to require emission controls. Two new processing plants are anticipated for development of the resources (see Land Use, Section V.D.1.a.1)e).

It was estimated that 134 exploratory wells will be drilled to identify the resources and 698 development/production wells and 28 platforms to develop the resources under this alernative. It was assumed, for the purposes of analysis, that production from an average platform would be 1.9 million barrels of oil and 8.0 billion cubic feet of gas per year. Two-thirds of the oil produced in the region is assumed to be transported through subsea pipelines. Estimated respresentative emissions for exploration/development are provided in Table V.D.1.a.2)d)-2. This informatin is derived from Table V.A.3-1.

Table V.D.1.a.2)d)-2. Estimated Representative Emissions

Activity	Production at Platform (tons per year)				
	VOC	NO_x	TSP	SO_2	CO
oil/gas	8.5	129	---	0.2	49
barging	63	---	---	---	--

A moderate qualitative impact is expected from routine emissions. The onshore area is predominately nonattainment for O_3 and the projected gas processing plants would cause locally high impact, but, only in the areas in which they would be located. Because of distance from shore, offshore emissions would not significantly affect onshore air quality.

Any emission sources which would adversely affect the onshore air quality would be subject to mitigation required by EPA and the State, if located onshore, or by DOI, if located on the OCS. ERG (1981) discusses mitigation measures for OCS facilities.

Because development will be well offshore, blowouts, oilspills, and fires would likely not impact the onshore air quality unless they lasted for several days.

Conclusion. The overall level of expected impacts for the region is moderate. High impacts imay occur in the vicinity of any new gas processing plants.

Cumulative Impacts. It is estimated that a total of 4.0 billion barrels of oil and 16.7 trillion cubic feet of gas exist in the entire North Atlantic Federal OCS planning area. In the event that total development of all Federal reserves occurs over the life of this proposal, 98 new platforms with 2443 wells would be required. It is very unlikely that this magnitude of development will occur over the life of this proposal.

The onshore air quality will only minimally be affected by the development activites in this planning area due to the prevailing winds from the west. On infrequent occasions the regional onshore air quality will be affected by OCS facilities, this impact should be low.

If all the proposed gas processing plants are installed, very high local cumulative air quality impacts will result. If the oil and gas produced as a result of this proposal replaces oil and gas presently being processed in onshore facilities (but coming from decreasing impact sources) no cumulative impact to local air quality would result, production levels at onshore facilities would remain stable with only the substitution of one source of new product for another source.

Overall, cumulative regional air quality impacts are expected to be moderate; local impacts will range from moderate to very high depending on the level of gas processing plant construction. However EPA rules associated with the Clean Air Act and the DOI air quality rules have provisions to minimize these impacts.

e) Impacts on Recreation

(1) Tourism: There are over 2,000 miles of beach in the North Atlantic Planning Area (U.S. Army Corps of Engineers, 1977 National Shoreline Study). In all of the affected States, tourist dollars represent a major portion of each State's economy. Even though the season of intensive beach use is short, ranging from July-August in the northernmost parts of the region to mid-May through mid-September in the more southern areas, coastal recreation in these States is a significant contributor to the regional and national economy.

Coastal recreation and open space areas could be affected by facility construction or by oilspills which reach shore. In addition, some offshore operations could be visible from shore in parts of the planning area and detract from the aesthetic aspect of a leisure experience.

In prior sales in this planning area, the scoping process elicited many responses from State and local government and environmental groups requesting that tracts within up to 50 miles of shore be excluded. This would ensure that offshore operations would not be visible from coastal areas and provide a buffer zone to protect beaches and other coastal resources from any oilspills that may occur in the proposed lease area.

Although the entire planning area would be offered under this Alternative, it is unlikely that any tracts would be leased from which offshore drilling activities could be visible from beach areas of New England, New York, and most of New Jersey. There is a slight chance that offshore operations could occur within nearshore Federal waters off the tip of Cape May County, New Jersey, or off the Delaware, Maryland, and Virginia Atlantic coastline. All of these areas have prime recreational beaches.

If any reas were leased, explored, and developed within up to about 20 miles of shore, there could be a visual impact. In order to see drilling operations about 20 miles from shore, there would have to be ideal atmospheric conditions. Even then, it is likely that only at night would a light on top of a drilling rig, which could reach 200-250 feet above sea level, be seen by someone standing on a beach. The viewer would not necessarily be able to distinguish such a light from one on a ship. From an area like Ocean City, Maryland, which is a barrier beach resort community with high-rise second home development, it is possible that drilling operations somewhat further from shore could be seen by persons on the upper floors of the high-rises. Any rigs and platforms which could be seen from shore would be obscured part of the time by fog or haze. If offshore drilling operations were visible from coastal recreation areas in this planning area, some individuals might consider this an adverse impact.

Leasing close to shore increases the probability that debris inadvertently lost from a rig or platform will wash ashore in a recreation area. This is a problem not only in terms of aesthetics, but increases maintenance costs for area administrators. Since there is a prohibition against disposing of trash overboard for vessels used in OCS oil and gas operations, the probability of such an occurrence will be minimal. Of the facilities that could result from sales on the proposed schedule, only the projected pipeline landfalls and rights-of-way are likely to compete for land used or suitable for recreation purposes. The assumed landfalls of the projected pipelines are in Little Compton, Rhode Island, and Bethany Beach, Delaware. These would cross sandy beach areas initially. As long as construction is timed for an off-peak season

for recreational use, and the site is restored to its previous condition, there should be no conflict between the landfalls or rights-of-way of the natural gas pipelines and the potential or actual recreational use of the land.

While short-term construction impacts related to the projected oil pipeline can also be timed for the off-peak season, there remains the possibility that a pipeline break or leak could occur and result in oil impacting a recreation area. In this case, the pipeline is assumed to landfall in Atlantic City, New Jersey. If an oilspill occurred from the nearshore segment of this assumed pipeline, there is up to about five percent chance that oil would contact land near or just south of Atlantic City. Although this could preclude beach use if it occurred during the summer months, it is unlikely that those attracted to Atlantic City for casino gambling would be affected.

The acquisition and construction of rights-of-way through the States assumed to have pipeline landfalls (Rhode Island, New Jersey, Delaware) offer the potential for these States to identify sites and acquire easements for such linear recreational uses such as horseback, hiking, and nature trails, and bikeways. Such uses would be consistent with policies in each State's statewide Comprehensive Outdoor Recreation Program.

None of the projected operations support bases would conflict with beach use, as all assumed sites are in industrially zoned areas. There could be some interference with recreational boating near the projected operations support bases resulting from an increase in vessel traffic. This would not necessarily be a severe impact since all projected ports are used by a variety of commercial vessels with which recreational boats currently coexist safely. It would, however, be an unavoidable adverse impact. No conflicts over berths used by recreational boats would occur.

In developing a Coastal Zone Management Program, States are required to identify coastally dependent uses and to establish a regulatory framework which will ensure that coastal land resources are not used inappropriately. Other policies deal with increasing access to coastal recreation areas. Any gas treatment or processing plant or other onshore facility likely to be needed would be sited in accordance with applicable Federal, State, and local land use policies. Thus, it is unlikely that any such facility would be sited in an area used or suitable for coastal recreational activities.

If an oilspill reached a beach area, the local economy of the area would be adversely affected. The extent of economic impact is extremely difficult to assess since the degree of impact depends on many variables that cannot be known in advance. These include the beaching location, the size and duration of the spill, the amount that comes ashore, the composition of the oil, the season in which it occurs, and the publicity that surrounds the occurrence. Beaches might have to be closed until cleanup is accomplished. Once cleaned-up, use levels might not return to normal due to adverse publicity, although people still tend to use beaches when the water is polluted.

Under this alternative, three spills greater than 10,000 barrels are projected, with these much more likely to be due to the transportation of the oil than its production. Coastal areas which would most likely not be impacted by spills from oil produced as a result of the sales on the proposed schedule include Connecticut, Long Island north shore areas, Massachusetts above Cape Cod, New

Hampshire, and Maine. Areas which could be impacted include Cape Cod, Martha's Vineyard, and Nantucket Island in Massachusetts, coastal areas of Rhode island, the south shore of Long Island, New York, and the Atlantic coastline of New Jersey, Delaware, Maryland and Virginia.

It is more likely that beachs within the planning area would be impacted by a spill resulting from tranportation of the oil than one resulting from production. This is due to the fact that the refineries to which it is most likely the OCS oil would be tankered are in New Jersey and the Philadelphia area.

If oil were to beach during or just prior to the peak summer months, the greatest impact on beach use would probably occur. An example of a popular coastal recreation area in the northern portion of the planning area is Cape Cod, and one in the southern portion is Ocean City, Maryland. These areas have significantly higher summer populations than year-round resident populations (Cape Cod's resident population is about 148,000). About 8 million visits were made to Cape Cod during 1979 for recreation-related purposes, and about 60 percent of these visits occurred during July and August. These visits resulted in $247 million in direct expenditures, of which amount about $127 million was spent during July and August (Cournoyer and Kindahl. 1980). While Ocean City, Maryland, has a resident population of about 4,000, seasonal populatin can reach 125,000 on a non-holiday weekend and 2000,000 on a holiday weekend. Estimated annual tourist expenditures for Ocean City in 1978/79 were $170 million (Maryland Dept. of Natural Resources, Jan. 1980). Thus, it is likely that an oilspill which hits an area such as Cape Cod or Ocean City during or just prior to the peak summer season would have a greater adverse impact on beach use and tourist revenues than one which occurred during another season.

An approximate loss is difficult to predict. One study which attempted to do so looked at the economic impact of a projected oilspill and its impacts on the south shore of Long Island (Long Island State Partk and Recreation Commission, 1977). The study concluded that "a medium-to-large oilspill occurring adjacent to Long Island and within the Ambrose-Nantucket route, could possibly wash ashore on Long Island beaches, resulting in losses to the regional economy of between $423,000 and $13.3 million per week." It is unlikely that the whole south shore of Long Island would be affected by a spill from OCS production or tankering of OCS produced crude oil. However, this study is the best available attempt to quanitfy such impacts and therefore is cited as an example. An oilspill could cause a shift in patterns of use and locations of expenditures rather than a total loss. The extent of existing tourist accomodations near non-impacted areas would limit the degree of shipting possible before overcrowding would occur.

Conclusions. The level of impacts to water-oriented recreational facilities from this proposal would be moderate because an oilspill could cause partial closure of some areas.

(2) Sport Fisheries: The estimated number of fish caught during 1979 in the North Atlantic portion of the Planning Area (ocean past three mile limit) was 7,239,000. In the ocean less than three miles from land the number was 9,303,000 (NOAA, 1979). In the North Atlantic, numerically bluefish, cod, winter flounder, mackerel, and scup were the most important species. In the Mid-Atlatnic sea bass, mackerel, weakfish, and

summer flounder were the most abundant. All of these species cover broad ranges nearshore, and possible impact to the sports fishery would be expected to be minimal. A nearshore oil spill may preclude fishing in specific areas, but this would be temporary condition and have little effect upon the overall recreational fishery in the North and Mid-Atlantic. Offshore in deeper water, marlin, tuna, swordfish, and mako shark are all considered excellent gamefish. All of these species extensively migrate and are very active swimmers. Special exclusion or any impacts from offshore oil and gas development would be expected to be minimal.

Recreationally, tilefish are predominatly fished in the canyonheads, from Baltimore Canyon to just north of Block Canyon. Hudson Canyon is probably the most important area for the recreational tilefish fishery in the planning area. Impacts on tilefish were discussed previously under canyon areas in the section on Habitats and Resources of special Concern.
The amount of space that a rig or platform would preclude from the recreational tilefish fishery would be minimal.

Conclusions. The impact to sport fisheries resulting from this proposal will be low due to the distribution of the most important recreational fisheries in the planning area.

Cumulative Impacts. In the unlikely event that all tracts offshore the North Atlantic are leased and developed over the life of the proposal, a total of 16 spills (3 from production and 13 from transportation) over 1,000 barrels each may occur over the life of the field. An estimated 93 spills greater than 1,000 barrels each could occur over a 30 year period from imported petroleum products. Since a total of approximately 96 oilspills greater than 1,000 barrels each could occur when all resoruces are considered (assuming OCS transportation spills substitute for an equal number of imports), the probability of one or more spills contacting prime recreational areas or sport fishing grounds would be moderately high and may cause the partial closure of some water-oriented recreational areas. A total of six pipelines (one oil and five gas) will be trenched through coastal areas under the cumulative case. Impacts from pipeline construction are generally short-term in nature and generally scheduled during the off-season for recreational areas. Facility construction from gas pipeline landfalls and rights-of-way and from activities other than OCS-related development could compete for land that is used or is suitable for coastal recreation. However, the affected states Coastal Zone Management Programs will ensure that coastal land resources are not used inappropriately. Therefore, the cumulative impact to recreational and sport fishing areas from OCS oilspills and pipeline construction, spills of imported oil, and from coastal zone development will probably result in the partial closure of some water-oriented recreational areas. Oilspills, mainly from imported oil, will be the principal impact producing factor. Under the proposal, 6 oilspills (1 from production and 5 from transportation) over 1,000 barrels each may occur and 3 pipelines (1 oil and 2 gas) are projected. These numbers indicate that the proposal contributes significantly (38 percent) to the cumulative number of estimated OCS spills, but not significantly (1 percent) to the total number of OCS and imported spills combined. Also under the proposal, 50 percent of the total number of projected pipelines will be constructed. Therefore, the proposal is expected to make a significant contribution to the anticipated cumulative impacts from OCS development, particularly from oilspills and pipeline construction. However, in comparison

to the total cumulative case (present and future OCS and non-OCS activities), the proposal does not contribute significantly to the total case. When the proposal is contrasted only with existing OCS development and non-OCS activities, it still does not contribute significantly to the total number of potential oilspills and their associated impacts.

f) Socioeconomic Impacts: Oil and gas development, like any new industrial development, may result in long and short-term changes in the employment, and consequently the population level of an area. Population change, by creating a corressponding change in the demand for public and private services and facilities, is perhaps the best indicator of potential stress on an area's social and physical resource base.

It has been estimated that the activity associated with this alternative could generate a regional total of approxmiately 6,200 jobs during peak activity, 2,200 of which would be directly related to OCS activity. The direct estimate was derived through the combination ofthe U.S. Geological Survey's resource and production schedule with several widely accepted studies (NERBC, 1976a, 1976b, Frederick R. Harris, Inc., 1977). Total employment, which includes direct, indirect, and induced employment, was estimated using multipliers suggested by county business patterns and earlier studies performed in this region, controlled to prior analysis of similar onshore impacts which utilized the multi-regional, multi-industry forecasting model developed by Curtis C. Harris, Jr. of the University of Maryland. The total employment figure represents less than one tenth of one percent of the region's civilian labor force.

A regional peak population increase of about 14,300 persons could be associated with the projected employment increase. This represents less than one tenth of one percent of the region's population, implying little or no significant stress on the public and private service and facilities of the region as a whole.

The population increases generated, while minimal on a regional basis, may not be uniformly insignificant throughout the region. Impacts are potentially more significant in those counties or independent cities in which direct investments of offshore-related primary activites may be located. The development scenarios assume that, although the North Atlantic Planning Area is characterized by a wide variation in economic structure and community organization, most direct support activity will locate in counties or independent cities of medium or high population density rather than one of the low density coastal communities. This is based on the fact that the low density counties and independent cities generally do not have sufficient industrial infrasturcture to support the gas and petroleum industries. The directly-affected counties and independent cities under this alternative include: Washington County, RI (operations support base), Hampton, VA (operations support base), New Castle County, DE (operations support base and gas facility), Bristol County, MA (gas facility). Potential local impacts from the level of activity associated with this alternative are expected to be minor in all the directly-affected counties and independent cities with the exception of Washington County, RI. Washington County, due to its relatively low baseline population and high anticipated support participation, may experience moderate physical and social infrastructure stress. Any stress on public and private services and facilities will be reduced to the extent that OCS generated employment may be absorbed by the local labor forces of these areas.

Certain factors have mitigated a larger estimated impact of OCS activity on the North Atlantic Planning Area. These include: 1) the fact that portions of rig crews and operations support personnel will commute on a bi-weekly or monthly basis from areas such as the Gulf of Mexico; 2) the high level and diverse nature of industrial development already existing within the region, and 3) that much of the fabrication of required equipment such as platforms and rigs will most likely be provided by established facilities outside of the region.

Conclusions. The level of activity associated with this proposal will result in a very low level of impacts on socioeconomic factors on a regional basis, and low to moderate impacts on a local basis. The only county likely to be moderately impacted is Washington County, Rhode Island.

Cumulative Impacts. In the event that all tracts offshore the North Atlantic are leased and developed during the life of the proposal, total OCS activity could generage a regional total of approximately 20,000 jobs during peak activity, 6,800 of which would be directly related to OCS activity. A regional peak population increases of about 46,000 persons could be associated with the projected employment increase.

In addition to the employment and population increases associated with the total OCS development, numerous other projects have been proposed in this region which will also generate increased employment and population levels. These include potential developments such as the proposed New England Energy Park in Bristol County, Massachusetts, coal export facilities, and various waterfront projects.

Though exact estimates of the employment and population increases generated by non-OCS projects are not available, the number, size, and nature of these facilities implies a much greater increase in the employment and population levels of the region, as well as the fact that many areas in the North Atlantic region have experienced industrial decline, little stress on public and private services and facilities would be expected in the region as a whole and the cumulative impact on the region would be low. In the cumulative case, counties supporting specific projects, such as Washington County, RI (operations support base), Hampton, VA (Operations support base), Brooklyn, NY (operations support base), New Castle County, DE (Operations support base and gas facility), Bristol County, MA (gas facility) Monmouth County, NJ (gas facility), and Norfolk, VA (gas facility) in the case of total OCS development are expected to experience low to moderate short-term stress, although high levels of local impact could also be experienced if, as in the case of Bristol County, Massachussetts (which is examined as the location of both the proposed New England Energy Park and a gas facility,) more than one new industry located in the same area.

The proposal represents one of many potential activities aimed at providing energy, revitalizing areas, or increasing general growth. As such it represents only a small percentage of regional development. Since non-OCS-related projects are much more prevalent than OCS, the contribution of the proposal to cumulative impacts is low whether all hydrocarbon resources are leased and developed or only prior leases and the proposal are developed.

3) Impacts on Other Management Plans

a) Coastal Zone Management: The Coastal Zone Management (CZM) Act of 1972, as amended, administered by the Office of Coastal Zone Management (OCZM), National Oceanic and Atmospheric Administration (NOAA) of the Department of Commerce, provides grants-in-aid to States for the development and implementation of management programs to control land and water uses in the coatal zone. In order to qualify for implementation funds, a State mush have its proposed State coastal management program approved by the Secretary of Commerce. The Act established a mechanism to balance the protection of the coastal environment with development and economic interests.

State CZM plans may restrict the placement of OCS pipelines, refineries or other support facilities in areas of particular environmental concern, and may set standards for their placement elsewhere. However, some provision for their appropriate location is required by the CZM Act, as amended.

In addition to the procedural requirements for coordination and consistency, the Federal CZMA established the Coastal Energy Impact Program (CEIP) to help coastal States and local communities better cope with the potential and actual impacts of OCS and other energy development activities. Under the proposed FY 82 budget, nearly all CEIP funding to the States (with the exception being $7 million in 308(c) grants) will be terminated. Development and approval grants have also been cut to $53 million. While the effects of these cuts on the continuation of State Coastal zone management efforts cannot be accurately determined at this time, it can be assumed that some States will have to significantly cut back their ongoing programs. Some programs may be terminated unless each State provides its own funding.

A total of eight North Atlantic States currently have approved Coastal Zone Management Programs. These States are: Maine, Massachusetts, Rhode Island, Connecticut New Jersey, Pennsylvania, Delaware, and Maryland. New Hampshire has developed a draft program document and New York is planning to release one shortly. Both states are hopeful of receiving approval from the OCZM during 1982. While Virginia is not participating in the Federal coastal zone management program, the Virginia Marine Resources Commission and the Council on the Environment exercise regulatory controls over land and water uses on the commwealth's coastal zone.

Maine's coastal zone management policies are generally supportive of OCS development on Georges Bank due to the positive stimulus that such development would have on certain sectors of the New England and Maine economies. Maine wants assurances that OCS development of Georges Bank will take place with maximum safeguards for environment and other resources of the area, including fish stocks and breeding areas. Maine will seek these safeguards through applying the consistency criteria embodied within its approved CZM Plan. In addition, the State also must grant concurrences with EPA issues NPDES permits, particularly with regard to discharge limitations.

OCS development is generally encouraged by the Commonwealth of Massachusetts as a possible means of providing oil and gas resources to New England. The Massachusetts CZM Program will allow this development to occur if special care is exercised to avoid harm to the coastal resources that already provide benefit to society. The most important of these are the fishery resources located in coastal waters (including known spawning areas and traditional fishing grounds); the quality of waters which serve to maintain the health and

harvestability of coastal fisheries; wildlife wingering, nesting, and migratory stopover areas; and the recreation resources of the coast, particularly the bathing beaches.

The Rhode Island program encourages the development of OCS oil and gas resources, provided that certain policies discussed in the approved program, and elaborated upon the State Energy Amendments, are adheard to. These policies regulate the siting, transfer or stroage facilities and power generating facilities within the State which require a permit from the Coastal Management Council. An application for one of these facilities must provide reliable and probative evidence that the proposal will not: 1) conflict with any Council plan or program; 2) make any area unsuitable for any use or activity to which it is allocated by a resources management plan or program; or 3) significantly damage the environment of the coastal region. The program document included a section on the development of a facilities plan for the Davisville-Quonset Point area, which is presently used as a support base for North and Mid-Atlantic OCS operations.

The State of Connecticut recognizes the importance of OCS development and has stated that these resources should be "developed in an orderly manner consistent with National energy and environmental policies." Five constraints which could affect the siting of major OCS-related facilities in Connecticut's coastal area include: 1) the large distance separating Connecticut from the major areas of OCS activity and the availability of suitable alternative sites closer to major lease areas; 2) the lack of suitable vacant tracts of land; 3) insufficient deepwater access to the coast for tankers; 4) transhipment problems posed by the narrow entrance channels to Long Island Sound and the existing large volumes of commercial and recreational boat traffic; and 5) air pollution which could result from gas plant or refinery construction. The State however, may experience some indirect impacts of OCS development due to increased production in the industrial sector. Ancillary industries, such as tool and machinery manufacturing, diving services and other support oriented businesses could be attracted to the State, as a result of OCS operations.

New Jersey's program generally encourages OCS development as long as all related onshore activities do not conflict with existing land uses and are conducted in accordance with the policies of the program. Onshore activities related to the development and production of offshore hydrocarbons must be carried out according to specific energy facility policies which relate to the need for an acceptability of all proposed new or expanded coastal energy facilities. The program states that while pipelines and pumping and compressor stations would be permitted within most coastal areas, oil and gas facilities should ideally be located outside these coastal locations on sites such as those adjacent to Raritan Bay.

Pennsylvania's program is supportive of the development of OCS oil and gas resources, "provided that the necessary environmental safeguards are enforced through regulations by the appropriate Federal and State agencies to ensure that the integrity of the adjacent fish and wildlife habitat is not irreparably damaged due to drilling and other development activities." (Policy VIII-4, Pennsylvania Coastal Zone Management Program August 1980.) The program notes, however, that it is highly unlikely that much onshore development will occur in Pennsylvania as a result of OCS activities, with the possible exception of existing Delaware Valley industries which could serve as ancillary industries.

The Delaware program has developed several specific policies with regard to OCS oil and gas development. While the coastal management program is generally supportive of OCS development and the potential need for the construction of OCS related facilities in the State, key policies regulate the location of new petroleum refineries, prohibiting them in the coastal strip, but allowing them inland. The siting of oil and gas pipelines which terminate in the coastal strip however, is prohibited. The State is also encouraging the development of existing port areas, such as Wilmington and Lewes, for OCS support base activities.

The location of oil, natural gas, and OCS-related facilities in Maryland's coastal counties is regulated by the Coastal Facilities Review Act and is administered by the Tidewater Administration in conjunction with other State agencies and local units of government. Facilities covered under this Act include natural gas facilities, pipelines, intermediate oil production terminals or refineries, oil and gas storage facilities, operation bases, and fabrication yards. These facilities must receive certification from the Maryland Department of Natural Resources before construction may begin. Maryland seeks involvement in the administration of OCS lands to ensure that the safest, cleanest technologies are employed during the exploratory and production phases of OCS oil and gas development.

In addition to the management tools available to States through the Federal Coastal Zone Management Program, numerous additional regulatory powers are available, which will allow States and localities to guide the site selection of OCS and other major energy related facilities. Statewide energy siting commissions, such as those found in Massachusetts, Rhode Island, New Jersey, Delaware and Virginia, review applications for major facilities to ensure compliance with Statewide policies and regulations. Facilities such as support bases, gas processing plants and pipelines must also be compatible with local zoning and use restrictions.

The locations for facilities assumed to be constructed for each alternative were selected based upon a cursory review of these State and local policies. It can be generally stated that there are no <u>major</u> conflicts with these policies. Final site selection for any of these facilities will however, depend upon detailed analysis of all State and local plans and policies.

b) Fishery Management Plans: Fishery Management Plans in this region have been adopted for surf clam and ocean guahog, and Atlantic butterfish, herring, mackerel, squid and groundfish. Where no Fishery Management Plans are in effect, Preliminary Fishery Management Plans (PMPs), which only cover foreign fishing are prepared by the Secretary of Commerce for each fishery for which a foreign nation requests a permit. The PMPs in effect as of March 15, 1980 include Atlantic hake, Atlantic billfishes, sharks and other Finfish (Atlantic). There should be little interaction between foreign commercial fishermen and OCS oil and gas activities in the North Atlantic. A change may occur however, as a result of a proposed fishing agreement between the United States and Canada.

Considering the small area which would be spacially excluded for fishing and that foreign fishing is primarily determined by a quota system, there should be little if any conflict between OCS activities and implementation of Fishery Management Plans in the North and Mid-Atlantic.

c) Maine Sanctuaries: On November 27, 1981, the Office of Coastal Zone Management of the U.S. Department of Commerce notified the Governor of Massachusetts that the nomination of Central Nantucket Sound would not be advanced to "active candidate status" for a national marine sanctuary. In December 1981, OZM reviewed the status of a similar proposal for Georges Bank and determined that no site or sites on Georges Bank should be listed as an Active Candidate for marine sanctuary status at that time. There are no additional active candidates for marine sanctuary designation in the North Atlantic at this time.

Given the absence of any proposed or designated marine sanctuary site in this planninga rea, there would be no impact or conflict with oil and gas activities under this Alternative.

d) Estuarine Sanctuaries: The only designated estuarine sanctuary in the North Atlantic region is located in Narragansett Bay, Rhode Island. This sanctuary includes Hope Island, Patience Island, the northern end of Prudence Island, and their surrounding waters for a total of 2,629 acres. OCS oil and gas related activities are not expected to interfere with the existing sanctuary uses due to its upstream location from the OCS support base at Davisville, Rhode Island, and relatively safe distance from Offshore oil drilling and transportation operations. In addition, the Office of Coastal Zone Management has published a final environmental impact statement on a proposed estuarine sanctuary for a small area in the Chesapeake Bay (August 1981) and a draft environmental impact statement for a multiple- site estuarine sanctuary in the Maine coastal zone (October 1981). The States of New Hampshire and New York are considering santuaries in the southern Great Bay area and the Hudson River estuary, respectively, but have not yet prepared any environmental statements.

Oil and gas exploration and development activities in the North and Mid-Atlantic regions are not expected to occur in the vicinity of any proposed estuarine sanctuaries.

4) Unavoidable Adverse Impacts

Coastal areas such as wetlands, estuaries, and sandy beach/dune habitats in the vicinity of the Delaware and Raritan Bays and those along the southern New Jersey coast may be impacted by oilspills resulting from OCS tankers and pipelines, respecitively.

Exploration and development activites would result in temporary and localized impacts on offshore water quality. Discharged drilling muds and cuttings and formation waters would temporarily cause increases in suspended solids, minor elevations in hydrocarbon levels, and oxygen deficientcies in a localized area. Treated sewage from rigs and platforms would increase levels of suspended solids (organic matter), BOD, nutrients, and chlorine in the immediate vicinity of the discharge. Temporary water column turbidity due to resuspention of sediments would result from pipeline installation. It has been estimated tha 6 spills greater than 1,000 barrels each could occur under the proposal. Spilled oil that is not recovered would release hydrocarbons and trace metals into the environment and would temporarily decrease water quality.

Industrial development and population growth due to the proposal could cause small, localized increases in water pollution. Water supply needs will generate increased demands on existing water supply systems.

The addition of OCS structures and vessels in these already heavily trafficked areas would increase the potential of both vessel to vessel and vessel to structure collisions.

Unavoidable land use impacts include those resulting from pipelaying and related land disturbances, which will be localized and temporary in nature, pipeline rights-of-ways, whose surface may be restored, and onshore support bases and gas processing plants, which would reduce the amount of land available for alternate uses for the life of the activity.

There is a very low probability of unavoidable losses of submerged and terrestrial cultural resources since the most prospective acreage is well removed from the areas with a high probability of containing preserved archaeological artifacts. Any onshore facilities likely to result from the proposal would probably be located in industrially zoned areas thus lessening the possibility of impacts on cultural resources.

Commercially important species will be affected by mortality to fish eggs and larvae and smothering of shellfish. Commercial fishermen will be affected by spatial exclusion of fishing activites and possible damage to gear. Spilled oil from the 6 estimated oilspills over 1,000 barrels each will cause some mortality in finfish and shellfish.

Coastal and onshore endangered species are not likely to be seriously affected by OCS activites under the proposal. Endangered marine mammals and sea turtles could suffer sublethal adverse impacts from oilspills, chronic discharges from drilling rigs and production platforms, collisions with service vessels, and temporary loss of prey. The mortality of some individuals could ultimately occur.

Some deposition of drill muds and cuttings could occur in important submarine canyons depending upon the locations of exploratory and development wells. If extensive drilling occurred in the Georges Bank area, there is a possibility that drilling fluids could ultimately be concentrated within the 60 m isobath and have a negative effect on fish eggs and larvae which are retained in this area.

Adverse impacts to coastal recreation areas in the North Atlatnic would result from oil spills which reach shore. The extent of the impact would depend on how much oil reached shore, during what season, and how quickly and effectively the spill was cleaned up. The effect of the proposal on sport fishing should be negligible due to the widespread distribution of the resources.

The pattern and magnitude of economic activity forecast could cause minor to moderate short-term stress on the physical and social infrastructure of some communities, especially those involved in primary OCS activities.

5) Relationship Between Short-term Uses of the Environment and the Maintenance and Enhancement of Long-term Productivity

For purposes of this section, short-term use is defined as the projected economic life of the project, and long-term productivity refers to the productivity of those resources or activities which existed prior to the proposal and have a lifetime exceeding the termination of oil and gas activities.

Increased short-term water demands could translate into declining onshore economic productivity in the long-run due to water-limited onshore industrial growth in some areas.

Short-term use of the OCS for mineral extractions will preclude commercial fishing in the immediate vicinity of oil and gas operations, but should not adversely affect long-term productivity.

Short-term adverse effects to marine biological communities would result from construction, normal operations and oilspills. Short-term losses would include a reduction in biological productivity, changes in marine habitats, potential population reductions for benthos, fish, birds, endangered marine mammals and sea turtles, and food web modification. There should be no significant long-term effect on plankton and benthos productivity. However, if population reductions for the higher order vertebrates does occur, it would have a long-term adverse effect on productivity, particularly for endangered and threatened species.

Many of the construction related impacts would be short-term in nature and consequently have a minimal amount of impact on the environment as a whole. For example, a particular segment of land would be disrupted by pipeline construction for only three to four weeks. Pipelines will be buried and within a short time the land can be restored to its previous condition.

It is possible that public and private services and facilities as well as a significant industrial base may be developed as a function of the proposed OCS activity and its associated employment and population growth. This added infrastructure may attract new industry and long-term gains in employment and population may be experienced once the short-term OCS activity has been completed.

6) Irreversible and Irretrievable Commitments of Resources

Leasing of the proposed tracts and subsequent development and extraction could represent an irreversible and irretrievable commitment of nonrenewable oil and gas resources.

The proposal would require land for rights-of-way for pipelines, gas processing plants, and operations support bases. Additional land for facilities stimulated in part by this proposed sale could also be required. Where new land uses result in the disruption or destruction of natural features or processes, such that the return to the previous land use is not possible, an irreversible commitment of resources would occur. Because of the relatively small amount of acreage required, the land use controls available to State and local governments, and the fact that wetlands will generally be avoided whenever possible, changes in land use in the region should not be significant.

THE MORE SIGNIFICANT ENVIRONMENTAL CONSEQUENES

North Atlantic

Resource Category	Level of Expected Impacts[1/] Scheduled Sales Only Under Alternative I-1	Cumulative Impacts from All Activities
1. General Impacts		
a. Coastal Ecosystems	moderate	high
b. Water Quality and Supply		
Water Quality	low	moderate
Water Supply	low	moderate
c. Navigation and Shipping	high	high
d. Other Uses of the OCS		
Military Uses	moderate	moderate
NASA	moderate	moderate
Ocean Dumping	moderate	moderate
e. Land Use		
Pipeline Landfalls	low	low
Gas Processing Plants	moderate	moderate
Service or Support Bases	low	low
f. Cultural Resources	low	low
2. Impacts of Special Concern		
a. Commercial Fisheries	moderate	moderate
b. Endangered Species	low	high
c. Habitats and Resources of Special Concern	moderate	moderate
d. Air Quality	moderate	high
e. Recreation		
Tourism	moderate	moderate
Sport Fishing	low	low
f. Socioeconomic Factors		
Regional	very low	low
County	moderate	high

[1/] Definitions of levels of impact are provided in the beginning of Section V.D.

This table also applies to Alternatives I-2, II, and IV.

The proposal could result in the production of certain OCS-related goods and services. To the extent that resources would be drawn away from other uses, production of goods and services in other areas of other types would be forgone. Steel products, specialized manpower, and capital constitute required resources which may be scarece; and use of these resource for OCS needs means that other opportunities for their use might have to be foregone. While these resources may be reclaimed over time, their use as a result of this proposed sale, would consitute an irreversible and irretrievable commitment of resources at a given point in time. To the extent that unemployed resources are used, the employment of resources wuld not consitute a cost to society in the form of foregone opportunities.

An irreversible or irretrievable commitment of biological resources and their habitats could occur in the area of a massive oilspill, or near areas that are subjected to chronic low levels of pollution. It is anticipated that an affected area will recover from a spill and that the natural flora and fauna would eventually reoccupy spill areas. Exceptions would be that irreversible or irretrievable losses of an endangered species may result if populations of such a species are affected by an oilspill, either directly or through food contamination, or by any other disruption or disturbance such as habitat loss that may result from the proposed sale.

Damage to archeological artifacts, sites, or historic shipwrecks would constitute an irretrievable loss of nonrenewable resources that could reflect early human occupation of the area. However, considering the paucity of evidence of human occupation of the North Atlatnic OCS and the distance of the tracts from shore the likelihood that activities resulting from the proposed sale would encounter such resources is considered.

b) Alternative I-2: The Proposed Schedule with Offerings of Favorable Geological Acreage

This option would retain the streamlining proposal but offer only the acreage of high potential. The environmental impacts that would result from this proposal will be essentially the same as those described under Alternative I-1 since the bulk of the analysis for Alternative I-1 was based on the assumption that only development of aras with high resource potential would occur. However, under Alternative I-1, some development could occur unexpectidly cutside the recognized high potential areas.

Impacts that could occur under Alternative I-1 that would not occur under Alternative I-2 would result from the fact that areas near shore off of New England, Long Island, and most of New Jersey would probably not be offered for leasing under Alternative I-2. Thus, offshore oil and gas operations would not be visible from those areas, and nearshore platform spills and routine discharges would not occur that could impact the resources found along the coasts of these areas. All other impacts noted under Alternative i-1 would be the same under Alternative I-2.

c) Alternative II: The April 1981 Draft Schedule

For the North Atlatnic planning unit, the potential impacts under Alternative II would be the same as those under Alternative I-1.

c) Alternative III-1: The Current Schedule, The Current System - No Action

Under this schedule, the North Atlantic region consists of the Georges Bank area only, and would include no Mid-Atlantic region acreage. Any sales on this schedule would be tract selection sales. Tracts on Georges Bank and on the continental slope would probably be selected. All tracts likely to be selected would be more than 50 miles from shore.

For a discussion of cumulative impacts that relates to this Alternative, see the section on cumulative impacts that follows each resource under North Atlantic Planning Area Alternative I-1. The contribution of Alternative III-1 to the cumulative impacts in all resource categories will be minimal.

1) General Impacts

a) Impacts on Coastal Ecosystems

Because the estimates of oil and gas resources and the projected infrastructure are significantly lower under this alternative than under Alternative I-1, the degree of impact to coastal ecosystems should also be lessened. Only 1 oilspill greater than, 1,000 barrels is anticipated to occur during the production life of the projected sales. Coastal ecosystems that would be expected to suffer from OCS sale-related spills would be restricted to the barrier islands and sandy beaches bordering the approach to Raritan Bay (Long Island , NY, and Martha's Vineyard and Nantucket Island, MA). Only a transportation spill would be expected to pose a threat to these ecosystems. Should a spill occur, there is a 6 percent probability that it would contact Long Island within tree days (LaBelle, 1981). Therefore, these coastal ecosystems could be exposed to a relatively un-weathered and possibly a more toxic oilspill.

Oilspills occuring during production are not expected to contact land within 30 days due to the distance from shore (approximately 100 miles) of the expected production area. Construction related impacts will be mimimal as only one gas pipeline will be needed to bring gas ashore (tankers will be used for oil). Pipeline trenching will cause a short-term disruption of sandy beach areas in the vicinity of Little Compton, RI. Support facilities will be located outside the coastal zone or at existing facilities and will not require the dredging or filling of any remaining coastal ecosystems.

Conclusion. The impacts to coastal ecosystems resulting from this alternative would be very low in contrast to moderate for Alternative I-1.

b) Water Quality and Supply

(1) Offshore Water Quality: The nature of impacts on ambient water quality from routine discharges resulting from this alternative would essentially be the same as described under Alternative I-1. The major difference would be that impacts would affect a smaller area as only the Georges Bank area would be offered under the proposal. With only 28 exploratory wells expected, only 280,000-840,000 barrels of drilling muds and 84,000 to 168,000 barrels of cuttings would be discharged to the water column during exploration. With the reduction in potential resource recovery, impacts

from oilspills would also be greatly reduced only one major spill over 1,000 barrels is assumed to occur. Also, because there would be only one gas pipeline, impacts related to pipeline installation would be minimal. As described under Alternative I-1, most impacts would be localized around OCS facilities, most likely to within 1,000 meters, depending on hydrographic conditions and would be temporary in nature. Significant water quality degradation is not expected as discharges would be diluted and dispersed in the large volume of receiving water.

<u>Conclusions</u>. As under North Atlantic Alternative I-1, the impacts to offshore water quality will be low because deviations from ambient measures will be temporary.

(2) Onshore Water Quality and Supply: The nature of impacts on onshore water quality and supply would be the same as described under Alternative I-1. The number of localities where any impacts could occur, however, would be greatly reduced as only one gas processing plant and one support base are expected under this alternative. Because the areas of Rhode Island and Massachusetts where these facilities are located presently have no significant industrial water supply problems, it is anticipated that the operation of these facilities would not create undue stress on these supplies. Also, a gas processing plant would have to be designed according to local site-specific conditions at the time.

The number of localities where local water quality could be affected would also be reduced from that assumed under Alternative I-1, although the nature of impacts would remain as described for that alternative.

<u>Conclusions</u>. As under Alternative I-1, impacts to onshore water quality and supply would be low.

c) Impacts on Navigation: No tracts within Traffic Separation Schemes would be offered under this Alternative.

Five platforms are projected to result from sales held under the Alternative III-1 schedule. While traveling between the Davisville, Rhode Island service base and the anticipated offshore structures, the approximately 22 supply boats (roughly 2640 round trips per year) assumed in these alternatives will utilize the Traffic Separation Schemes (TSS) present at the approach to Narragansett Bay. Once outside the TSS, measures described in Alternative I-1 should lessen any hazard that these, as well as any other, vessels might present. Oil will be tankered to refineries in the New York or Philadelphia areas, because it is assumed that OCS oil will replace foreign imports, tanker traffic in the New York and Philadelphia shipping lanes should not increse.

<u>Conclusions</u>. Impacts to navigation under this Alternative would be low in contrast to high under North Atlantic Alternative I-1.

d) Other Uses of the OCS

Military, NASA, and Ocean Dumping Activities: Similar use conflicts as those discussed under Alternative I-1 would occur between OCS oil and gas operations and ongoing military activities. There would be no conflict

with ocean dumping or with NASA activities because NASA does not conduct operations in the Georges Bank area and no ocean dumping occurs there.

The military Operating Areas which could coincide with selected tracts include the Boston, Narragansett Bay, and Atlantic City Operating Areas, and Air Force Warning Area V-506. Specific area coordination with DOD will take place on a sale-by-sale basis.

Conclusions. Use conflicts between OCS and gas operations and military activities would be moderate as under Alternative I-1.

e) Impacts on Land Use: This alternative could necessitate the construction of only one gas pipeline at Little Compton, RI, and one gas processing plant in Bristol County, MA. Tankers would transport the oil, and the lone support base would be at Davisville, RI. The impacts of these facilities are detailed under Alternative I-1. Only the gas processing plant would cause a moderate level of land use impacts. The projected landfall and operations support base would have very low impacts.

Conclusion. As in Alternative I-1, the proposed gas processing plant would cause moderate land use impacts. The other projected facilities would cause very low land use impacts in contrast to low under Alternative I-1.

f) Impacts on Cultural Resources: The offshore area with a significant probability of containing preserved cultural resources is restricted from Buzzards Bay through the Northern Gulf of Maine due to marine transgression and the strong current systems of the region. In many places the area with a high cultural resource potential does not extend as far east as the shoreline. The chance of impacts on cultural resources resulting from oilspills or platform installation is therefore extremely remote. Because it is assumed that oil discovered in the Georges Bank region would be tankered to shore, impacts from oil pipeline construction and leakage would not occur. The one gas pipeline with a landfall at Little Compton, Rhode Island does not traverse, to any great degree, an area with significant probability of containing cultural resources.

Conclusions. The impacts in cultural resources would be very low in contrast to low under Alternative I-1.

2) Impacts of Special Concern

a) Impacts on Commercial Fisheries: Impacts to commercial fisheries under Alternative III-1 will be similar to those previously discussed for Alternative I-1 because Georges Bank is such an important fishing area. These impacts could result from oilspills, (18 anticipated in excess of 1,000 barrels) the discharge of drill muds and cuttings, formation waters, and the spacial exclusion due to the placement of rigs, platforms, and pipelines. Under this alternative there will be 28 exploratory wells and 123 development/production wells drilled. The overall impacts from this alternative will be signficantly lower than those previously described under Alternative I-1.

Conclusions. As under Alternative I-1, impacts on commercial fisheries would be moderate.

b) Impacts on Endangered Species: The impacts to endangered species under this alternative should be very minimal due to the small number of estimated oilspills (1 greater than 1,000 barrels), only one projected gas pipeline landfall, and to the smaller size of the offering area (due to tract selection). In addition, it is anticipated that the area offered will be in deeper offshore waters which would tend to reduce the probability of a platform spill contacting coastal-oriented species.

Conclusions. OCS-related impacts under this alternative should be verylow in contrast to low under Alternative I-1.

c) Habitats and Resources of Special Concern: The major canyons in the North Atlantic include Corsair, Lydonia, Gilbert, Oceanographer, Welker, Hydrographer, Veatch and Atlantic. Under this alternative, 28 delineation wells and 123 production wells are expected to be drilled. Under this alternative, the possibility of impact to either canyon areas or the shallower area within the 60 m isobath on Georges Bank is greatly dependent on discharge criteria and the placement of OCS structures. With less drilling activity expected under this alternative, there could be less expected impact to the habitats of concern than Alternative I-1.

Conclusions. As under Alternative I-1, the impacts to biological resources in canyons would be moderate.

d) Air Quality: Under this alternative it is estimated that 28 exploratory wells will be required to describe the resources and 123 development/production wells and five platforms to develop the resources. the development of the resources will occur over 50 miles from the North Atlantic planning area coastline. Because of this distance and the fact that prevailing winds blow from the west, offshore emissions are not considered to affect onshore air quality.

One gas processing plant, to be located in Bristol County, MA, is expected for this alternative (see Land Use, Section V.D.1.d.1)e)). Massachusetts is in nonattainment for O_3 and therefore, the addition of a gas processing facility is expected to result in moderate impacts. If new gas processing facilities e not needed, the impact is expected to be low.

Conclusions. The level of expected impacts is moderate due to the expected siting of one gas processing plant in a nonattainment area. This is the same level of expected impact as for Alternative I-1.

e) Impacts on Recreation

(1) Tourism: Offshore operations would not be visible from shore because any rigs on tracts leased would be too far from shore to be seen.

The only facility likely to compete with a coastal recreation area is the projected gas pipeline assumed to landfall on Little Compton, Rhode Island. Any impact associated with pipelaying operations would be temporary and minor as long as construction occurred in an off-season for beach use and the site was restored.

Oilspills from production would not be likely to hit any coastal recreation area because of the distance from shore. Oilspills from transporation of OCS oil could impact coastal areas of Cape Cod, Nantucket, Martha's Vineyard, Long Island, and possibly New Jersey, because the oil would probably be tankered to refineries in the nrothern New Jersey or Philadelphia areas. Only 1 spill of greater 1,000 barrels has been projected from transportation of the oil as a result of the sales under this Alternative. The degree of impact from oilspills depends on the amount that reaches shore, the season in which this occurs, and the effectiveness of the cleanup.

Conclusions. Impacts to shoreline recreation would be low in contast to moderate under Alternative I-1.

(2) Impacts on Sports Fisheries: The most geologically favorable acreage for OCS development is located on the continental slope. Little recreational fishing occurs have except for seasonal big game fishing. Because these are highly migratory species, there is expected to be little conflict was OCS development. Little recreational fishing occurs on Georges Bank because of the distance from shore.

Conclusions. Impacts on sports fishing will be very low in contrast to low under Alternative I-1.

f) Socioeconomic Impacts: Based on the methodology described in Alternative I-1, it has been estimated that the activity associated with the development of the Georges Bank in this manner could generate a regional total of approximately 1,300 jobs during peak activity, 500 of which would be directly related to OCS activity. The total employment figure represents less than one tenth of one precent of the region's civilian labor force.

A regional peak population increase of only 3,000 persons could be associated with the projected employment increase. This respresents less than one tenth of one percent of the regions population, implying no significant stress on the public and private services and facilities of the region as a whole.

Local impacts, while potentially significant in counties assumed to be directly-affected by OCS activities, are expected to be very minor due to the low resource level projected for this alterantive. Specific counties identified in this alternative as directly- affected include Washington County, RI (operations support base) and Bristol County, MA (gas facility).

Little or no industry relocation is expected and significant portions of rig crews and operations support personnel are expected to commute on a bi-weekly or monthly basis from areas such as the Gulf of Mexico.

Conclusions. As in Alternative I-1, regional socioeconomic impacts will be very low. Local county level ones will be low in contrast to moderate under I-1.

e. Alternative III-2: Current (June 1980) Schedule - Offering Greater Acreage per Sale

THE MORE SIGNIFICANT ENVIRONMENTAL CONSEQUENES

North Atlantic

Resource Category	Level of Expected Impacts[1/] Scheduled Sales Only Under Alternative III-1	Cumulative Impacts of All Activities
1. General Impacts		
a. Coastal Ecosystems	very low	high
b. Water Quality and Supply		
Water Quality	low	moderate
Water Supply	low	moderate
c. Navigation and Shipping	low[2/]	high
d. Other Uses of the OCS	Moderate	moderate
e. Land Use		
Pipeline Landfalls	very low[2/]	low
Gas Processing Plants	moderate	moderate
Service or Support Bases	very low[2/]	low
f. Cultural Resources	very low[2/]	low
2. Impacts of Special Concern		
a. Commercial Fisheries	moderate	moderate
b. Endangered Species	very low[2/]	high
c. Habitats and Resources of Special Concern	moderate	moderate
d. Air Quality	moderate	high
e. Recreation		
Tourism	low[2/]	moderate
Sport Fishing	very low[2/]	low
f. Socioeconomic Factors		
Regional	very low	low
County	low[2/]	high

1/ Definitions of level of impact are located at the beginning of Section V.D.

2/ Differs from the proposal.

For the North Atlantic planning unit, the potential impacts under Alternative III-2 would be the same as those under Alternative III-1.

f. Alternative IV-1.a: Delete 7 Alaska Sales, Change the Timing of Others Using Area-wide Offerings.

For the North Atlantic planning unit, the potential impacts from this Alternative would be identical to those described for Alternative I-1.

g. Alternative IV-1.b: Delete 7 Alaska Sales, Change the Timing of Others Offering Favorable Geological Acreage.

For the North Atlantic planning unit, the potential impacts from this Alternative would be identical to those described for Alternative I-1.

h. Alternative IV-2.a: Delete all Arctic Planning Areas from the Schedule While Using Planning Area-wide Offerings.

For the North Atlantic planning unit, the potential impacts from this Alternative would be identical to those described for Alternative I-1.

i. Alternative IV.2.b: Delete all Arctic Planning Areas from the Schedule While Offering Favorable Geological Acreage.

For the North Atlantic planning unit, the potential impacts from this Alternative would be identical to those described for Alternative I-1.

THE MORE SIGNIFICANT ENVIRONMENTAL CONSEQUENES

North Atlantic

Resource Category	Level of Expected Impacts[1/] Scheduled Sales Only Under Alternative III-2	Cumulative Impacts of All Activities
1. General Impacts		
a. Coastal Ecosystems	very low	high
b. Water Quality and Supply		
Water Quality	low	moderate
Water Supply	low	moderate
c. Navigation and Shipping	low[2/]	high
d. Other Uses of the OCS	moderate	moderate
e. Land Use		
Pipeline Landfalls	very low[2/]	low
Gas Processing Plants	moderate	moderate
Service or Support Bases	very low[2/]	low
f. Cultural Resources	very low[2/]	low
2. Impacts of Special Concern		
a. Commercial Fisheries	moderate	moderate
b. Endangered Species	very low[2/]	high
c. Habitats and Resources of Special Concern	moderate	moderate
d. Air Quality	moderate	high
e. Recreation		
Tourism	low[2/]	moderate
Sport Fishing	very low[2/]	low
f. Socioeconomic Factors		
Regional	very low	low
County	low[2/]	high

1/ Definitions of level of impact are located at the beginning of Section V.D.

2/ Differs from the proposal.

2. Mid-Atlantic

The only Mid-Atlantic offering under any of the Alternatives is proposed Sale No. 76. After this, the Mid-Atlantic leasing region will be subsumed into a new North Atlantic planning unit which extends from Maine to North Carolina.

The contribution of this Mid-Atlantic sale to the North Atlantic cumulative case would be minimal in all resource categories, and, therefore, cumulative impacts are not discussed separately for the Mid-Atlantic. The reader should consult the cumulative impact section which follows North Atlantic Alternative I-1.

a. Alternative I-1: The Proposed Schedule with Planning Area-Wide Offerings

1) General Impacts

a) Impacts on Coastal Ecosystems

Coastal ecosystems that could potentially be affected under Alternative I-1 include sandy beaches and barrier islands, bays and estuaries bordered by saltwater marshes, and all their associated fish and wildlife resources. The types and nature of systems are discussed in detail under the North Atlantic Planning Region, Alternative I-1. Impacts specific to the Mid-Atlantic Planning Region are dependent upon the resource estimate and the projected infrastructure. Since a relatively low number of oilspills (one from production and two from transportation) over 1,000 barrels each could result from oil development and production planning region wide, coastal ecosystems should face a minimal risk of exposure to an OCS oilspill. The barrier islands and sandy beaches bordering the approaches to the Delaware and Raritan Bay refineries could be vulnerable to OCS tanker spills. The coastal ecosystems south of Atlantic City, NJ, could be vulnerable to a pipeline spill. If production takes place in deeper offshore waters as anticipated, any oilspills from the production area would pose a minimal threat to all coastal areas. However, if any production takes place in shallow nearshore waters, the probability of an oilspill contacting shore will increase. A short-term disruption of some sand beach and wetlands areas will occur from the installation of one oil and two gas pipelines. The one projected oil pipeline could pose an additional threat to coastal ecosystems by way of an oilspill. Assuming that a pipeline spill has occurred, there is a five percent or less probability that the spill would contact shore in the vicinity of Atlantic and Cape May Counties, NJ (FES OCS Sale No. 59, Appendix D, Table 10).

Conclusion. The impacts to coastal ecosystems in the Mid-Atlantic under this proposal will be low because OCS exploration and development is not expected to pose a serious threat to coastal ecosystems in the planning region.

b) Impacts on Water Quality and Supply

1) Offhsore Water Quality

Generic impacts to offshore water quality are detailed under North Atlantic Alternative I-1. Briefly, these are that discharged

drilling muds and cuttings would temporarily increase suspended solids and trace metals in the immediate vicinity of drilling rigs. Discharged formation waters would cause localized, minor elevations in inorganic salts, tract metals, and hydrocarbon levels around platforms, reducing oxygen levels near the point of discharge. Three oilspills greater than 1,000 barrels are projected. Oilspills and chronic discharges of oil would temporarily increase hydrocarbon levels and toxic products of oxidation in the water column. Treated sewage from rigs and platforms would increase levels of suspended solids (organic matter), BOD, nutrients and chlorine in the immediate vicinity of the discharge. Temporary water column turbidity due to resuspension of sediments would be caused by pipeline installation.

Conclusion. Impacts to offshore water quality would be low because this proposal would result in temporary and localized deviations from ambient measures.

2) Onshore Water Quality and Supply

Generic onshore water quality impacts would be the same as described under North Atlantic Alternative I-1, but the locations where these impacts could occur would be different. In this case, pipeline landfalls and gas processing plants are assumed to be located in Monmouth County, NJ, and Norfolk, VA, and support bases in Davisville, RI, and Hampton Roads, VA. The areas where gas processing plants would be sited would experience onshore water pollution impacts, although these would be low because all permit requirements would need to be met. Water supply restrictions in local areas would influence the design of any plant that is built, so local supplies would not be greatly impacted. Although most areas where facilities are proposed to be located have abundant water supplies, industrial supply for the New Jersey area, which is heavily dependent on surface water sources, is already reaching maximum development capacity due to large demands by competing users.

Conclusion. Impacts to onshore water quality and supply under this proposal would be low because local supplies could be stressed.

c) Impacts on Navigation

Twenty-three platforms are assumed to result from sales held under the Alternative I-1 schedule. While traveling between the Davisville, RI and Hampton Roads, VA service bases and the offshore structures, the approximately 45 supply boats making roughly 5,400 round trips per year assumed in this alternative will utilize TSS's present at the approaches to Chesapeake and Narragansett Bays. Once outside the TSS's, measures described in Alternative I-1, North Altantic Planning Region, should lessen any hazard these vessels might present. Oil not piped to shore will be tankered to refineries in the New York or Philadelphia areas.

Areas within the Delaware Bay and Chesapeak Bay Traffic Separation Schemes (TSS) have some potential of containing geologically prospective acreage. If leased, structures would not be allowed within the traffic lanes of the TSS, but could be sited within the separation zones. For a generic description of possible impacts of OCS activities on navigation, the reader is referred to the discussion in the Alternative I-1, North Atlantic Planning Region section.

Conclusion. The impacts on vessel traffic resulting from the proposal would be high because tracts within Traffic Separation Schemes could be leased, and overall, this is a high vessel traffic area.

d) Impacts on Other Uses of the OCS

1) Military and NASA Activities

Potential use conflicts exist between OCS oil and gas activities and military and NASA operations. Specific area coordination takes place on a sale-by-sale basis through which operational restrictions and notification requirements which mitigate these conflicts are agreed upon. The military operating areas which could coincide with areas offered for leasing include the Narragansett Bay, Atlantic City, Patuxent River and Virginia Capes Operating Areas. The controlling authority for these areas is the Commanding Officer, Fleet Area Control and Surveillance Facility, Virginia Capes Naval Air Station, Oceana, VA. The controlling authority is responsible for ensuring that DOD acitivities are coordinated with OCS oil and gas operations. Activities conducted by NASA from the Wallops Flight Center, VA, could also conflict with OCS oil and gas activities.

Conclusion. Use conflicts between military and NASA operations and OCS oil and gas activities will be moderate.

2) Ocean Dumping

All active and proposed ocean dumping sites described in the North Atlantic Planning Region section on ocean dumping are located in the Mid-Atlantic portion of the planning unit. Use conflicts between OCS oil and gas activities and ocean dumping occur under the proposal in the Mid-Atlantic such that some dumping activities could need to be relocated. There is also a potential for interactions (synergistic effects) of discharges from rigs and platforms with ocean-dumped wastes, although this is considered unlikely.

Conclusion. Impacts on ocean dumping would be moderate due to oil and gas operations posing some conflicts with dumping activities.

e) Impacts on Land Use

One oil pipeline (Atlantic City, NJ landfall) and two gas pipelines (Sea Girt, NJ and Virginia Beach VA landfalls) are anticipated under this alternative. Gas processing plants could be located in Monmouth County, NJ and Norfolk, VA and support bases could be sited in Davisville, RI and Hampton Roads, VA. The level of impact for each of these facilities is summarized in the land use impacts table. The general existing land use is as follows:

FACILITY	GENERAL EXISTING LAND USE
Oil pipeline-Atlantic City, NJ	Recreational beach, urbanized are inland
Gas pipelines	

Sea Girt, NJ	National Guard Camp on beach, abandoned RR ROW inland
Virginia Beach, VA	Recreational beach, light residential/military base inland
Gas processing plants	
Monmouth Co., NJ	Site of 60 acres is industrially zoned
Norfolk, VA	Varied land uses predominate. Industrially zoned land is required
Support bases	
Davisville, RI	Facility already used as support base, 450 acreas are available for OCS development
Hampton Roads, VA	Zoned for light industrial use. Has 3 cargo piers available

Conclusion. Impacts on land use will be low for all OCS related facilities other than gas processing plants which would cause moderate impacts.

f) Impacts on Cultural Resources

Assuming that holding the Mid-Atlantic sales under the Alternative I-1 schedule results in the discovery of commercial oil and gas deposits, 23 offshore platforms and three pipelines could be constructed. Because the most geologically promising areas are located in the reef complex approximately 100 miles from shore, it is unlikely that any of the 23 platforms would be placed in areas with a high potential of containing submerged cultural resources. Such areas tend to be in proximity to the shoreline.

Of the three pipelines assumed to be needed to transport oil and gas, shell middens, black earth middens and villages are types of sites which could be impacted by the Sea Girt gas pipeline; shell middens, black earth middens, villages and fishing camps by the Atlantic City oil pipeline; and fishing camps, shell middens, black earth middens and villages by the Virginia Beach gas pipeline (Institute for Conservation Archaeology, 1979). Impacts which could result from these pipelines include site discovery and disturbance of buried resources. In the case of the oil pipeline, site damage caused by leakage during the production phase could also result. For a generic description of the possible impacts on cultural resources resulting from OCS activities the reader is referred to the discussion under Alternative I-1, North Atlantic Planning Region.

Conclusion. The overall impact on cultural resources is expected to be low under Alternative I-1.

2. Impacts of Special Concern

a. Impacts on Commercial Fisheries

Nearshore: A variety of coastal zone activities including industry, agriculture, residential development and recreation have

all helped to degrade the environment through siltation, wetland destruction, dams, dredging, sewage dumping and chemical and thermal discharges into the marine environment. There have been losses of spawning areas and rivers for species such as striped bass, Atlantic salmon and shad, and loss of shellfish areas due to dredging, filling and pollution, a prime example being the Great South Bay on Long Island. Siltation has also limited many former oyster producing areas. The major events and influences from OCS development are oilspills, loss of fishing space, and pipelines in the coastal zone.

The hard clam is found within an area extending from Cape Cod south to Cape Hatteras. The industry is centered in the Great South Bay on Long Island. An oilspill could be moved by tidal action through Fire Island Inlet, but oil containing equipment is stored in the immediate vicinity.

Almost the total soft clam catch in the Mid-Atlantic Region is made in Chesapeake Bay. This population is not considered susceptible to an oil spill originating from a platform or pipeline due to its location up-bay and to the net down-bay movement of Chesapeake Bay water. Other coastal populations of soft clam would be more exposed to an oilspill but the populations tend to be small and isolated. A single spill should not seriously affect the soft clam industry of the Mid-Atlantic states.

Populations of bay scallops occur from Cape Cod to Barnegat Bay, NJ. The most valuable fishery grounds are in New York waters; principally Gardiners, Peconic and adjoining bays. The probability of an oilspill occurring and impacting this area is low but contamination could remain for a few years and affect larval recruitment because of the isolation of the breeding stock.

Commercial populations of oyster are found in Long Island Sound, Delaware Bay, Chesapeake Bay, with a secondary population near the Delmarva Peninsula. Because of net tidal movement, the Bays and Long Island Sound would probably be protected, but the population along the ocean side of Delmarva Peninsula would be exposed and, therefore, more susceptible. No data are available for the oyster fishery in this area, therefore potential economic losses cannot be estimated.

Significant quantities of blue crabs occur along the coasts of New Jersey and Delmarva Peninsula and within and at the mouth of Chesapeake Bay. An oilspill at the mouth of Chesapeake Bay would be especially harmful during the winter which would kill overwintering females or during the summer when larvae would be impacted. Either possibility would probably result in a year class failure which would impact the commercial fishery.

Numerous species are dependent upon the estuaries either for developmental stages or as a passageway going to and from fresh water for spawning. These include winter and summer flounder, striped bass, shad, smelt, black sea bass, bluefish, American eel, weakfish and others. A spill may have a serious impact upon local population but most species have broad geographical ranges and a spill within any single bay may not have a significant effect on the total population.

Offshore: Pelagic fish eggs which float at or near the surface can be vulnerable to pollution since the surface film can contain high concerntrations of contaminants (Mac Intyre, et al. 1974). Studies have shown

that a number of chemical contaminants including heavy metals, pesticides, and petroleum hydrocarbons can cause damage and death to embyros during early development stages. Floating eggs and larvae may suffer extensive mortality from contact with a surface oilspill. At least fourteen species of commercially important finfish and shellfish spawn have eggs (or larvae) which are transported into the Mid-Atlantic Region. These are surf calms, menhaden, yellowtail flounder, sea scallop, lobster, summer flounder, silver hake, scup, white hake, ocean quahog, black sea bass, tilefish, bluefish, and Atlantic mackerel.

Transport of larvae is more complex because they are more widely distributed and their development is much longer. As larvae develop in many species, they begin to make vertical movements and some go to the bottom rather quickly. This would be advantageous to species which utilize the onshore flow near the bottom to get ashore. Among species which spawn offshore whose larvae (or juveniles) use estauaries for nursey grounds are summer flounder, black sea bass, spot, croaker, and others.

There are probably a number of fish communities that contribute to the ichthyofauna of the continental slope area. These communities all overlap as adults, in the transition zone that make up the slope region. They include species abundant in the shelf areas but whose reproductive products move onto the slope, away from more desirable areas. Significant loss of this reproductive stock to the open ocean could affect the success of year classes of commercially important fish species. Demersal slope species, such as macrourids (grenediers, rattails) reproduce primarily in these waters. Mesopelagic fish, such as myctophids (lanternfish) are abundant in the deeper slope waters, and possibly the products of bathal fishes, common below 2,000 m that drift into the slope zone all contribute to the ichthyofauna of the slope area.

Variations in survival of larvae are believed to control the major fluctuations in population size. Biologically, larval mortality is partly a function of the density distribution of the larvae, their predators and prey, other species which may be competitors or alternate prey for their predators, and transportation within specific temperature regimes. The short-term physical proceses (tides, internal waves, small scale vertical distribution, diurnal heating/cooling, and wind effects, particularly storms) also dominate the dynamics of these communities, with wind probably the most important factor (Grosslein and Azarovitz, In Press).

The spawning areas of the predominant species in the Mid-Atlantic are extremely general and not well defined as is the case with the Georges Bank area. Larval survival, as explained earlier is involved in complex, small scale (hours to days; tens of meters to kilometers) or medium scale (one to ten weeks; tens to hundreds of kilometers) dynamics of planktonic communities during which the fate of a population or year class is decided.

Nelson-Smith (1972) suggested that actively swimming species avoid contamination since significant fish kills have not been observed following offshore oilspills. Based on these avoidance reactions, mortality to adult fin fish is not expected to be significant but impacts on eggs and larvae could have an effect on the commercial fisheries. Evaluating environemntal effects and expressing them quantitatively can be misleading, especially when

consideration is given to the tremendous natural variation in the marine environment. Oilspill probabilities based on historical observations may or may not apply to new fields with improved technologies. The behavior of the spill is uncertain because the characteristics of Mid-Atlantic oil is unknown.

Exposure of commercial fish and shellfish species to oil may cause tainting of the flesh and reduce the marketability of the product. Sea trout and plaice were reported to be tainted during tests, as were other fish caught after the oil spillage from the Torrey Canyon (Clark, 1973).

Pipeline Placement: Many of the fish and shellfish harvested are present along the assumed pipeline corridors and are principally caught by bottom trawling and dredging.

Pipeline dredging in nearshore coastal areas may have a more significant effect than dredging in offshore waters because of possible high concerntrations of materials such as pesticides and heavy metals. Dredging activity suspends these materials which could make them available for uptake by fish, invertebrates and phytoplankton. Resuspension of fine sediments could cause suffocation of demersal eggs and mortality of some benthic organisms. Because of the small area of bottom disturbed and the rapid recolonization rate of inshore benthic communities, no significant effect is anticipated on demersal fish which are dependent on benthic organisms as food.

Drilling Activities: Drill cuttings could accumulate beneath each platform but would be expected to be confined to a localized area around the platform. The finer materials, composed mostly of drill muds with some pulverized cuttings, would initially be suspended in the water column, thus contributing to turbidity. The configuration of the plume would be dependent upon prevailing tides, currents and winds. Because the size of the plume from an individual rig would be expected to be small there should be little impact upon the commercial fisheries.

Larval organisms are generally more sensitive to the chemical constituents of drilling fluids than are juvenile and adult stages. Gerber et al. (1980) showed larvae of northern shrimp and lobster more sensitive than adults. This mortality was observed during 96 hour static bioassays using concentrations of whole mud or fractions that would occur only near the point of discharge. It was concluded that toxic effects to meroplankton will be unlikely, given the depth of the discharge and rapid dilution of the effluent.

Conclusion. Impacts on commercial fisheries under this proposal would be moderate, because although the industry may suffer some economic loss, overall, it would not be measurable against the natural variation in fish stocks.

b) Impacts on Endangered Species

The species of concern in this region include those discussed under the North Atlantic Region (Alternative I-1). The bald eagle and peregrine falcon would continue to be vulnerable to OCS related spills (three greater than 1,000 barrels estimated) mainly during migratory periods. An oil pipeline landfall near Atlantic City, NJ, could disrupt breeding peregrines during its construction or could affect breeding success should a pipeline spill occur. Support facilities and gas pipeline landfalls

should not adversely affect these species as these facilities are expected to be located in areas of existing development. Some individuals species, particularly eagles and falcons, could suffer adverse or lethal effects from contacting an oilspill, but the effect on the total population should be negligible.

Among the five species of sea turtles occurring in the region (see North Atlantic Alternative I-1), only the loggerhead and leatherback are present in relatively high numbers. Sea turtles in general could be adversely affected by inhaling or ingestng spilled oil, by feeding on oil contaminated prey, or prey exposed to chronic rig discharges, and by collisions with service vessels. A total of 23 production platforms will be discharging drill muds and formation waters. The long-term effect of these discharges on sea turtles are not known. Since a total of three oilspills over 1,000 barrels each is estimated to occur over the production life of the field, some sea turtle mortalities could occur. However, a long-term adverse effect on each species from OCS production and development under Alternative I-1 are not anticipated. There are some loggerhead turtle nesting areas in the southern portion of the region, but these nesting beaches are not expected to be exposed to any adverse oil and gas related impacts unless drilling takes place close to shore which is not expected.

The general impacts on endangered whales under this alternative would be essentially the same as those discussed under the North Atlantic Alternative I-1 execpt that there are no major feeding grounds known for the Mid-Atlantic Planning Region (CETAP, 1981). The Mid-Atlantic Region appears to function mainly as a migration corridor for endangered whales. No important breeding grounds have yet been identified in the region although it has been suggested that the fin whale may breed in the southern portions of the region. Because these whales are moving through the region and are not thought to stop or feed to any great degree in the area, it is unlikely that they will be exposed to any significant adverse impacts from oilspills. However, production and development activities may disrupt normal cetacean behavior as noted above. The low number of estimated spills greater than 1,000 barrels (three) may cause some localized adverse effects but should not result in any serious long-term effects to the endangered whales.

Conclusion. Impacts to endangered species in the Mid-Atlantic under this proposal will be low because oil and gas exploration and development under Alternative I-1 is not expected to pose a serious threat to any endangered species in the planning region.

c) Impacts on Habitats and Resources of Special Concern

Possible sensitive areas in the Mid-Atlantic Region are the canyon areas. The canyons on the Mid-Atlantic Region have been found to be less active geologically than the canyons of the North Atlantic, being more analogous to the continental slope regions. Blocks near or within Toms Canyon, Wilmington and Baltimore Canyons have previously been drilled. Rig placement and directional drilling can mitigate any possible impacts to canyons from oil and gas activities.

Conclusion. Overall, the impacts on resources in canyons in the Mid-Atlantic from this proposal would be low, although lobster and tilefish in canyons could be impacted moderately.

d) Impacts on Air Quality: A discussion of the primary factors used in assessing onshore air quality impacts which may result from OCS-related activities and the method employed in quantifying the impact on this planning area are described in Section V.A.3. of this document.

Information on nonattainment areas in the planning area is provided in Table V.D.2.a.2)d)-1.

Table V.D.2.a.2)d)-1. Nonattainment Areas within the Region

State	Area	Nonattainment Pollutants
New York	New York Metro	TSP, CO, O_3
New Jersey	New York Metro	TSP, CO, O_3
	New Jersey Intrastate AQCR	TSP, CO, O_3
Delaware	New Castle County	O_3
Virginia	Hampton Roads Intrastate AQCR	O_3

It is estimated that 118 exploratory wells will be drilled to identify the resources and 564 development/production wells and 23 platforms to development the resources under this alternative. It was assumed, for the purposes of analysis, that production from an average platform would be 1.2 million barrels of oil and 5.0 billion cubic feet of gas per year. Two-thirds of the oil produced in the region is assumed to be transported by tanker or barge while 1/3 will be transported through subsea pipelines. Estimated representative emissions for exploration/development are provided in Table V.D.2.a.2)d)-2. This information is derived from Table V.A.3-1.

Table V.D.2.a.2)d)-2 Estimated Representative Emissions

Activity	Production at Platform (tons per year)				
	VOC	NOx	TSP	SO2	CO
oil/gas	6	89	-	0.1	34
barging	40	-	-	-	-

It was estimated that OCS facilities located within 20 miles of the coastline would require emission controls. The most likely location of facilities, given current information on location of hydrocarbon resources, is beyond 20 miles and thus are not expected to need emission controls. Two new gas processing plants are anticipated for development of the resources (see Land Use, Section V.D.2.a.1)e)).

A moderate qualitative impact is expected from routine emissions. The onshore area is predominatily nonattainment for O_3 and the projected gas processing plants could cause high impact in the areas in which they would be located. Because of distance from shore, offshore emissions would not significantly affect onshore air quality.

Any emission sources which would adversely affect the onshore air quality would be subject to mitigation required by EPA and the State if located onshore, or by DOI, if located on the OCS. ERG (1981) discusses mitigation measures for OCS facilities.

Because development will be well offshore, blowouts, oilspills, and fires would likely not impact the onshore air quality unless they lasted for several days.

Conclusions. A moderate impact is expected to air quality as a result of development associated with adoption of Alternative I-1. High impacts will occur in the vicinity of the new gas processing plants.

e) Impacts on Recreation

1) Tourism

In the Mid-Atlantic Planning Region, there are approximately 1,000 miles of beach. The tourist revenues generated in the coastal areas represent a major contribution to each state's economy. The season of peak beach use averages three moonths. Many of the coastal communities in this region have fairly small year round resident populations and experience large influxes of summer visitors.

Coastal recreation areas in this region could be affected by facility construction or by oilspills which reach shore. In addition, some offshore operations could be visible from shore in parts of the planning region and detract from the aesthetic aspect of a leisure experience.

There is a slight chance that offshore operations could occur within nearshore Federal waters off the tip of Cape May County, NJ, or off the Delaware, Maryland, and Virginia Atlantic coastlines. If any areas were leased, explored, and developed within about 20 miles of shore, there could be a visual impact. From an areas like Ocean City, MD, which is a barrier beach resort community with high-rise second home development, it is possible that drilling operations somewhat further from shore could be seen by persons on the upper floors of the high-rises. Any rigs or platforms which could be seen from shore would be obscured part of the time by fog or haze. If offshore drilling operations were visible from coastal recreation areas in this region, some individuals might consider this an adverse impact.

Of the facilities that could result from this proposal, only the projected pipeline landfalls and rights-of-way are likely to compete for land used or suitable for recreation purposes. The landfalls of the projected pipelines are assumed to be in Sea Girt, NJ, and in Virginia Beach, VA.. These would cross sandy beach areas initially. As long as construction is timed for an off-peak season for recreational use, and the site is restored to its previous condition, there should be no conflict between the landfalls or rights-of-way of the natural gas pipelines and the potential or actual recreational use of the land.

While short-term construction impacts related to the projected oil pipeline can also be timed for the off-peak season, there remains the possibility that a pipeline break or leak could occur and result in oil soiling a recreation area. In this case, the pipeline is assumed to landfall in Atlantic City, NJ. If an

oilspill occured form the nearshore segment of this assumed pipeline, there is up to about a five percent chance that oil would contact land near or just south of Atlantic City. Although this could preclude beach use if it occurred during the summer months, it is unlikely that those attracted to Atlantic City for casino gambling would be affected.

Under Alteranative I-1, 1.6 spills greater than 10,000 barrels are projected, with these much more likely to be due to the transportation of the oil than its production. Coastal areas which could be impacted by spills from oil produced as a result of the sales on the proposed schedule or from transportation of any crude oil produced on the OCS include the south shore of Long Island, NY, and Atlantic coastline of New Jersey, Delaware, Maryland, and Virginia.

If an oilspill reached a beach area, the local economy of the area would be adversely affected. The extent of economic impact is extremely difficult to assess since the degree of impact depends on many variables that cannot be known in advance. These include the beaching location, the size and duration of the spill, the amount that comes ashore, the composition of the oil, the season in which the spill occurs, and the publicity that surrounds the occurrence. Beaches might have to be closed until cleanup was accomplished. Once cleaned up, use levels might not return to normal due to adverse publicity, although people will still use beaches when the water is polluted.

Approximate losses are difficult to predict. See the discussion under the North Atlantic Alternative I-1 for some examples of studies which looked at the economic contribution of recreation or possible economic impacts of oilspills in the region. An oilspill could cause a shift in patterns of use and locations of expenditures rather than a total loss. The extent of existing tourist accommodations near nonimpacted areas would limit the degree of shifting possible before overcrowding would occur.

Conclusion. The level of impacts to water-oriented recreational facilities from this proposal would be moderate because an oilspill could cause partial closure of some areas.

2) Sports Fisheries

In the Mid-Atlantic, recreational fishing in the planning areas (beyond three miles) totalled 6,251,00 by number of fish caught and 7,196,000 were captured within three miles of shore. By number of fish caught in the Mid-Atlantic, sea bass, mackerel, weakfish and summer flounder were the most important. All of these species cover broad ranges nearshore, and possible impact to sports fishery would be expected to be minimal. A nearshore spill could preclude some space depending on size of spill but this would be a temporary condition and have little effect upon the overall recreational fishery in the Mid-Atlantic.

Offshore in deeper water, marlin, tuna, swordfish, and mako shark are considered important gamefish. All of these extensively migrate and are very active swimmers, therefore oil and gas development is expected to have little effect on these pelagic gamefish.

Tilefish are found in the canyon areas along the Mid-Atlantic region and possible impacts have been described under Alternative I-1.

Conclusion. Impacts from OCS development on the recreational fisheries in the Mid-Atlantic will be low.

f) Impacts on Socioeconomic Factors

Oil and gas development, like any new industrial development, may result in long and short-term changes in the employment, and consequently population level of an area. Population change, by creating a corresponding change in the demand for public and private services and facilities, is perhaps the best indicator of potential stress on an area's social and physical resource base.

If has been estimated that the activity associated with this alternative could generate a regional total of approximately 4,900 jobs during peak activity, 1,800 of which would be directly related to OCS activity. The direct estimate was derived through the combination of U.S. Geological Survey's resource and production schedule with several widely accepted studies (NERBC, 1976a, 1976b, Frederick R. Harris, Inc., 1977). Total employment, which includes direct, indirect, and induced employment, was estimated using employment multipliers suggested by county business patterns and earlier studies performed in this region, controlled to prior analyses of similar onshore impacts which utilized the multiregional, multiindustry forecasting model developed by Curtis C. Harris, Jr. of the University of Maryland. The total employment figure represents less than one tenth of one percent of the region's civilian labor force.

A regional peak population increase of about 11,300 persons could be associated with the projected employment increase. This represents less than one tenth of one percent of the region's population, implying no significant stress on the public and private services and facilities of the region as a whole.

The population increases generated, while minimal on a regional basis, may not be uniformly insignificant throughout the region. Impacts are potentially more significant in those counties or independent cities in which direct investments or offshore primary activities may be located. The Mid-Atlantic Planning Region, although characterized by a well developed nature as a whole, contains many low density, relatively undeveloped coastal areas as well. The development scenarios assume, however, that most direct support activity will locate in counties and independent cities of medium or high density rather than one of the low density counties and independent cities generally do not have sufficient industrial infrasturcture to support the gas and petroleum industries. These directly-affected counties and independent cities include: Washington County, RI (operations support base), Hampton, VA (operations support base), Monmouth County, NJ (gas facility), and Norfolk, VA (gas facility). Potential local impacts from the level of activity associated with Alternative I-1 are expected to be minor in all directly-affected counties and independent cities. Any potential stress on public and private services and facilities will be reduced to the extent that OCS-generated employment may be absorbed by the local labor forces of these areas.

Certain factors have mitigated a larger estimated impact of OCS activity on the Mid-Atlantic Planning Region. These include: 1) the fact that portions of rig crews and operations support personnel will commute on a bi-weekly or monthly basis from areas such as the Gulf of Mexico, 2) the high level and diverse

nature of industrial activity already existing within the region, and 3) that much of the fabrication of required equipment such as platforms and rigs will most likely be provided by established facilities outside the region.

Conclusion. The level of activity associated with this proposal will result in a very low level of impacts on socioeconomic factors on a regional basis, and a low level of impacts on a local (county) basis.

3) Impacts on Other Management Plans

See the North Atlantic planning unit for the portions of this section which apply to the Mid-Atlantic.

4) Unavoidable Adverse Impacts:

Coastal areas such as wetlands, estuaries, and sandy beach/dune habitats in the vicinity of the Delaware and Raritan Bays and those along the southern New Jersey coast may be impacted by oilspills resulting from OCS tankers and pipelines, respectively.

Exploration and development activites would result in temporary and localized impacts on offshore water quality. Discharged drilling muds and cuttings and formation waters would temporarily cause increases in suspended solids, minor elevations in hydrocarbon levels, and oxygen deficientcies in a localized area. Treated sewage from rigs and platforms would incrase levels of suspended solids (organic matter), BOD, nutrients, and chlorine in the immediate vicinity of the discharge. Temporary water column turbidity due to resuspension of sediments would result from pipeline installation.

Spilled oil would release hydrocarbons and trace metals into the environment and would temporarily decrease water quality.

Industrial development and population growth due to the proposal could cause small, localized increases in water pollution. Water supply needs will generate increased demands on existing water supply systems.

The addition of OCS structures and vessels in the already heavily utilized North Atlantic area would increase the potential of both vessel to vessel and vessel to structure collisions.

Unavoidable land use impacts include those resulting from pipelaying and related land disturbances, which will be localized and temporary in nature, pipeline rights-of-ways, whose surface may be restored, and onshore support bases and gas processing plants, which would reduce the amount of land available for alternate uses for the life of the activity.

There is a very low probability of unavoidable losses of submerged and terrestrial cultural resources since the most prospective acreage is well removed from the areas with a high probability of containing preserved archaeological artifacts. Any onshore facilities likely to result from the proposal would probably be located in industrially zoned areas thus lessening the possibility of impacts on cultural resources.

Commercially important species will be affected by mortality to fish eggs and larvae and smothering of shellfish. Commercial fishermen will be affected by spatial exclusion of fishing activities and possible damage to gear. Spilled oil from the 3 estimated oilspills over 1,000 barrels each will cause some mortality in finfish and shellfish.

Coastal and onshore endangered species are not likely to be seriously affected by OCS activities under the proposal. Endangered marine mammals and sea turtles could suffer sublethal adverse impacts from oilspills, chronic discharges from drilling rigs and production platforms, collisions with service vessels, and temporary loss of prey. The mortality of some individuals could ultimately occur.

Some deposition of drill muds and cuttings could occur in important submarine canyons depending upon the locations of exploratory and development wells. If extensive drilling occurred in the Georges Bank area, there is a possibility that drilling fluids could ultimately be concentrated within the 60 m isobath and have a negative effect on the fish eggs and larvae which are retained in this area.

Adverse impacts to coastal recreation areas in the North Atlantic would result from oilspills which reach shore. The extent of the impact would depend on how much oil reached shore, during what season, and how quickly and effectively the spill was cleaned up. The effect of the proposal on sport fishing should be negligible due to the widespread distribution of the resource.

The pattern and magnitude of economic activity forcast could cause minor to moderate short-term stress on the physical and social infrastructure of some communities, expecially those involved in primary OCS activities.

5) Relationship Between Short-term Uses of the Environment and the Maintenance and Enhancement of Long-Term Productivity

For purposes of this section, short-term use is defined as the projected economic life of the project, and long-term productivity refers to the productivity of those resources or activities which existed prior to the proposal and have a lifetime exceeding the termination of oil and gas activities.

Short-term use of the OCS for mineral extraction will preclude commercial fishing in the immediate vicinity of oil and gas operations, but should not adversely affect long-term productivity.

Short-term adverse effects to marine biological communities would result from construction, normal operations and oilspills. Short-term losses would include a reduction in biological productivity, changes in marine habitats, potential population reductions for benthos, fish, birds, endangered marine mammals and sea turtles, and food web modifications. There should be no significant long-term effect on plankton and benthos productivity. However, if population reductions for the higher order vertebrates does occur, it would have a long-term adverse effect on productivity, particularly for endangered and threatened species.

Increased short-term water demands could translate into declining onshore economic productivity in the long-run due to water-limited onshore industrial growth in some areas.

Many of the construction related impacts would be short-term in nature and consequently have a minimal amount of impact on the environment as a whole. For example, a particular segment of land would be disrupted by pipeline construction for only three to four weeks. Pipelines will be buried and within a short time the land can be restored to its previous condition.

It is possible that public and private services and facilities as well as a significant industrial base may be developed as a function of the proposed OCS activity and its associated employment and population growth. This added infrastructure may attract new industry and long-term gains in employment and population may be experienced once the short-term OCS activity has been completed.

6) Irreversible and Irretrievable Commitment of Resources

Leasing of proposed tracts and subsequent development and extraction could represent an irreversible and irretrievable commitment of nonrenewable oil and gas resources.

The proposal would require land for rights-of-ways for pipelines, gas processing plants, and operations support bases. Additional land for facilities stimulated in part by this proposal could also be required. Where new land uses result in the disruption or destruction of natural features or processes, such that the return to the previous land use is not possible, an irreversible commitment of resources would occur. Because of the relatively small amount of acreage required, the land use controls available to State and local governments, and the fact that wetlands will generally be avoided whenever possible, changes in land use in the region should not be significant.

The proposal could result in the production of certain OCS-related goods and services. To the extent that resources would be drawn away from other uses, production of goods and services in other areas or of other types would be foregone. Steel products, specialized manpower, and capital constitute required resources which may be scarce; and use of these resources for OCS needs mean that other opportunities for their use might have to be foregone. While these resources may be reclaimed over time, their use as a result of this proposal would constitute an irreversible and irretrievable commitment of resources at a given point in time. To the extent that unemployed resources are used, the employment of resources would not constitute a cost to society in the form of foregone opportunities.

An irreversible or irretrievable commitment of biological resources and their habitats could occur in the area of a massive oilspill, or near areas that are subjected to chronic low levels of pollution. It is anticpated that an affected area will recover from a spill and that the natural flora and fauna would eventually reoccupy spill areas. Exceptions would be that irreversible or irretrievable losses of an endangered species may result if populations of such a species are affected by an oilspill, either directly or through food

THE MORE SIGNIFICANT ENVIRONMENTAL CONSEQUENCES

Mid-Atlantic

Resource Category	Level of Expected Impacts[1/] Scheduled Sales Only Under Alternative I-1	Cumulative Impacts from All Activities*
1. General Impacts		
a. Coastal Ecosystems	low	high
b. Water Quality and Supply		
Water Quality	low	moderate
Water Supply	low	moderate
c. Navigation and Shipping	high	high
d. Other Uses of the OCS		
Military Uses	moderate	moderate
NASA	moderate	moderate
Ocean Dumping	moderate	moderate
e. Land Use		
Pipeline Landfalls	low	low
Gas Processing Plants	moderate	moderate
Service or Support Bases	low	low
f. Cultural Resources	low	low
2. Impacts of Special Concern		
a. Commercial Fisheries	moderate	moderate
b. Endangered Species	low	high
c. Habitats and Resources of Special Concern	low	moderate
d. Air Quality	moderate	high
e. Recreation		
Tourism	moderate	moderate
Sport Fishing	low	low
f. Socioeconomic Factors		
Regional	very low	low
County	low	high

[1/] Definitions of levels of impact are provided in beginning of Sec.V.D.
* The Mid-Atlantic cumulative case is part of the North Atlantic planning area cumulative development.

(This table also applies to Alternatives I-2, II, III-2, and IV. See text.)

contamination, or by any other disruption or disturbance such as habitat loss that may result from the proposed sale.

Damage to archeological artifacts, sites, or historic shipwrecks would constitute an irretrievable loss of nonrenewable resources that could reflect early human occupation of the area. However, considering the paucity of evidence if human occupation of the North Atlantic OCS and the distance of the tracts from shore the likelihood that activities resulting from the proposal would encounter such resources is considered remote.

b. Alternative I-2: The Proposed Schedule with Offerings of Favorable Geological Acreage

This option would retain the streamlining proposal but offer only the acreage of high potential. The environmental impacts that would result from this proposal will be essentially the same as those described under Alternative I-1 since the bulk of the analysis for alternative I-1 was based on the assumption that only development of areas with high resource potential would occur. However, under Alternative I-1, some development may occur outside the high potential areas.

Impacts that could occur under Alternative I-1 that would not occur under Alternative I-2 would result from the fact that areas near shore off of southern New England, Long Island, and most of New Jersey would not be offered for leasing. Thus, offshore oil and gas operations would not be visible from those areas, and nearshore platform spills and routine discharges would not occur that could impact the coastal and nearshore resources of these areas. All other impacts noted under Alternative I-1 would be the same under Alternative I-2.

c. Alternative II: The April 1981 Draft Schedule

For the Mid-Atlantic planning unit, the potential impacts under Alternative II would be the same as those under Alternative I-1.

d. Alternative III-1: The Current Schedule, The Current System - No Action

1) General Impacts

a) Impacts on Coastal Ecosystems

The impacts to coastal ecosystems under Alternative III-1 should be relatively low due to the small number of estimated oilspills (two) over 1,000 barrels each, only two projected pipeline landfalls (one oil and one gas pipeline), and to the smaller size of the offering area (due to tract selection). In addition, it is anticipated that the offering area will be in deeper offshore waters which would further reduce the probability of an oilspill contacting any coastal areas.

Conclusion. Impacts to coastal ecosystems under Alternative III-1 should be very low compared to low for Alternative I-1.

b) Impacts on Water Quality and Supply

Only about 75 percent of the platforms and wells projected under Alternative I-1 would be required in this case, but since all offshore water quality impacts are expected to be localized and temporary in all cases, the impacts on offshore water quality are essentially the same as under Alternative I-1 and remain low. Onshore, one less gas processing plant is projected (Norfolk, VA). The impacts are projected to be low because the plant could be designed to meet any supply constraints that may exist.

Conclusion. Impacts on both offshore water quality and onshore water quality and supply would be low, as under Mid-Atlantic Alternative I-1, because they would be temporary and localized.

c) Impacts on Navigation

In the Mid-Atlantic, geologically favorable areas are concentrated in the reef complex. The 17 offshore platforms assumed in Alternative III-1 would be serviced by approximately 37 supply boats (roughly 4,440 round trips per year) operating from Davisville, RI and Hampton Roads, VA. At the approaches to Narragansett and Chesapeake Bays these vessls would utilize existing TSS's. Further offshore, measures described in Alternative I-1, North Atlantic Planning Region, should lessen any hazard these vessels might present. Oil not transported to shore via pipeline would be tankered to refineries in the New York or Philadelphia areas. Tracts within Traffic Separation Schemes would most likely not be offered under this Alternative.

Conclusion. Impacts on vessel traffic from this Alternative will be low compared to high under Alternative I-1.

d) Impacts on Other Uses of the OCS

1) Military and NASA activities and
2) Ocean Dumping

Potential use conflicts would be the same as under Alternative I-1.

Conclusion. Impacts would be moderate, as in Alternative I-1, for military and ocean dumping use conflicts, but low instead of moderate for NASA use conflicts.

e) Impacts on Land Use

One oil pipeline (Atlantic City, NJ landfall) and one gas pipeline (Virginia Beach, VA landfall) could be required. A single gas processing plant would be constructed in Norfolk, VA and support bases would be operated out of Davisville, RI and Hampton Roads, VA. The potential impacts of these facilities are noted in Alternative I-1.

Conclusion. As under Alternative I-1, impacts on land use will be low for all OCS-related facilities, other than for gas processing plants, which would cause moderate impacts.

f) Impacts on Cultural Resources

Mid-Atlantic areas of greatest interest to the oil and gas industry are concentrated in the reef complex. The 17 platforms assumed are therefore unlikely to be placed in areas with a high cultural resource potential which are in proximity to the shoreline. Likewise, the probability of an oilspill reaching shore from such a great distance and contacting onshore cultural resources is very low.

The two pipelines required to transport the oil and gas in this alternative have landfalls at Atlantic City, NJ and Virginia Beach, VA respectively. For an identification of the types of sites which could be impacted by these pipelines refer to the Alternative I-1 discussion. Impacts which could result from these pipelines include site discovery and disturbance of buried resources. In the case of the oil pipeline, site damage caused by oil leakage during the production phase could also result. For a generic description of possible impacts on cultural resources resulting from offshore oil and gas activities, refer to the discussion under Alternative I-1, North Atlantic Planning Region.

Conclusion. As in Alternative I-1, there would be a low level of impacts on cultural resources resulting from oil and gas activites.

2) Impacts of Special Concern

a) Impacts on Commercial Fisheries

The most favorable area geologically is concerntrated in the reef complex buried along the continental slope. Because of this geological feature of interest, Alternative III-1 should be very similar to Alternative I-1 in levels of impact to the fishery resources of the Mid-Atlantic region.

There are probably a number of fish communities that contribute to the ichthyofauna of the continental slope area. These communities all overlap as adults, in the transition zone that make up the slope region. They include species abundant in the shelf areas but whose reproductive products move onto the slope, away from more desirable areas. Significant loss of this reproductive stock to the open ocean could affect the success of year classes of commercially important fish species. Demersal slope species, such as macrourids (grenediers, rattails) reproduce primarily in these waters, and possibly the products of bathal fisher, common below 2,000 m that drift into the slope zone all contribute to the ichthyofauna of the slope area.

The spawning area of the predominant commercial species in the Mid-Atlantic Region are extremely general and not well defined. Variations in survival of larvae are believed to control the major fluctuations in population size. Biologically, larval mortality is partly a function of the density distribution of the larvae, their predators and prey, other species which may be competitors or alternate prey for their predators, and transportation within specific temperature regimes. The short-term physical processes (tides, internal waves, small scale vertical distribution, diurnal heating/cooling, and wind effects, particularly storms) also dominate the dynamics of these communities, with wind probably the most important factor.

Conclusion. Possible effects on the commercial fishing industry from OCS activity under Alternative III-1 should be similar to the impacts described under Alternative I-1, which would be moderate.

b) Impacts on Endangered Species

The impacts to all endangered species under Alternative III-1 should be very low due to the small number of estimated oilspills (two) greater than 1,000 barrels each, to a reduction in activities associated with oil and gas production and development (estimated 17 production platforms), and to a reduction in the size of the offering area due to tract selection. In addition, it is anticipated that the offering area will be in deeper offshore waters which would tend to reduce the probability of a platform spill contacting species that utilize coastal waters.

Conclusion. OCS related impacts under Alternative III-1 should be very low on all endangered species in the area in contrast to low under Alternative I-1.

c) Impacts on Habitats and Resources of Special Concern

Possible impact on canyons is greatly dependent on rig placement and discharge criteria established under NPDES permits by EPA. Any possible impacts would be similar to Alternative I-1.

Conclusion. Impacts on resources found in canyons would be low, as in Alternative I-1.

d) Impacts on Air Quality

Under Alternative III-1, it is estimated 90 exploratory wells will be required to describe the resources and 564 development/production wells and 23 platforms to develop the resources. The development of the resource will occur the same distance offshore (over 20 miles) as discussed in Alternative I-1. Thus, no emmission controls are expected to be needed on the OCS platforms. One gas processing plant could be required (see Land Use, Section V.D.2.d.1)e)) in Norfolk, VA. This is in a non-attainment area for O_3 and therefore Moderate impacts as defined in V.D. expected to result.

Conclusion. Moderate air quality impacts are expected to result from the development of resources described in Alternative III-1. This is the same level as expected under Alternative I-1.

e) Impacts on Recreation

1) Tourism

The impacts would be somewhat reduced than those projected under Alternative I-1 because of the distance from shore that operatons would likely occur. Since only one gas pipeline is projected, only a sandy beach in the vicinity of Virginia Beach, VA would be temporarily affected. One oilspill greater than 10,000 barrels is projected in this case, but the severity of impact still depends on how much reaches shore, during what

season, and how it is cleaned-up. It would be rather unlikely if any tracts from which operations could be seen from shore would be offered, so aesthetic impacts would be negligible.

Conclusion. Potential impacts on recreation would be low in contrast to moderate under Alternative I-1.

2) Impacts on Sport Fisheries

Impacts to pelagic game fish have been described under Alternative I-1. Possible impact to sport fishing for tilefish in canyon heads could be mitigated by tract selection and discharge criteria among other measures.

Conclusion. The possible impact to sport fishing is low as in Alternative I-1.

f) Impacts on Socioeconomic Factors

Based on the methodology described in Alternative I-1, it has been estimated that the activity associated with the development of the Mid-Atlantic Region in this manner could generate a regional total of approximately 3,300 jobs during peak activity, 1,200 of which would be directly related to OCS activity. The total employment figure represents less than one tenth of one percent of the regions civilian labor force.

A regional peak population incrase of 7,600 persons could be associated with the projected employment increase. This represents less than one tenth of one percent of the region's population, implying no significant stress on the public and private services and facilities of the region as a whole.

Local impacts, while potentially significant in counties or independent cities asumed to be directly affected by OCS activity, are expected to be minor. This is due to the relatively low level of anticipated OCS development. Specific counties or independent cities identified as possibly affected in this alternative include: Washington County, RI (operations support base), Hampton, VA (operations support base), and Norfolk, VA (gas facility).

Factors that have mitigated a larger estimated impact of OCS activity on this region include: 1) the fact that portions of rig crews and operations support personnel will commute on a biweekly or monthly basis from areas such as the Gulf of Mexico, 2) the high level and diverse nature of industrial development already existing in the region, and 3) that much of the fabrication of required eauipment such as platforms and rigs will most likely be provided by established facilities outside of the region.

Conclusion. Impacts would be the same as in Alternative I-1, very low on a regional basis and low on a county basis.

e) Alternative III-2: Current (June 1980) Schedule - Offering Greater Acreage per Sale

For the Mid-Atlantic planning unit, the potential impacts under Alternative III-2 would be the same as those under Alternative I-1.

THE MORE SIGNIFICANT ENVIRONMENTAL CONSEQUENCES

Mid-Atlantic

Resource Category	Level of Expected Impacts 1/ Scheduled Sales Only Under Alternative III-1	Cumulative Impacts from All Activities*
1. General Impacts		
a. Coastal Ecosystems	very low 2/	high
b. Water Quality and Supply		
Water Quality	low	moderate
Water Supply	low	moderate
c. Navigation and Shipping	low 2/	high
d. Other Uses of the OCS		
Military Uses	moderate	moderate
NASA	low 2/	moderate
Ocean Dumping	moderate	moderate
e. Land Use		
Pipeline Landfalls	low	low
Gas Processing Plants	moderate	moderate
Service or Support Bases	low	low
f. Cultural Resources	low	low
2. Impacts of Special Concern		
a. Commercial Fisheries	moderate	moderate
b. Endangered Species	very low 2/	high
c. Habitats and Resources of Special Concern	low	moderate
d. Air Quality	moderate	high
e. Recreation		
Tourism	low 2/	moderate
Sport Fishing	low	low
f. Socioeconomic Factors		
Regional	very low	low
County	low	high

1/ Definitions of levels of impact are provided in beginning of Sec.V.D.

* The Mid-Atlantic cumulative case is part of the North Atlantic planning area cumulative development.

2/ Differs from the proposal.

f,g,h,i Alternatives IV

For each Alternative IV case, the impacts in the Mid-Atlantic would be the same as under Alternative I-1.

3. South Atlantic

a. Alternative I-1: The Proposed Schedule with Planning Area Wide Offerings

The description of the proposal, Alternative I-1, is provided in Chapter III of this document. The data on estimated oil and gas resources, the statistically expected number of oil spills associated with the development of the resources, and the infrastructure required for resource development are discussed in the subsections below as appropriate for the individual resource categories.

The analysis of impacts associated with the adoption of Alternative I-1 is based upon the assumption that only areas with favorable geologic characteristics (most favorable areas or most likely areas) will be leased and subsequently developed. The impacts related to Alternative I-1 and I-2 are therefore essentially identical. There is, however, a possibility that resource development could occur outside the most likely areas if the area-wide leasing approach (Alternative I-1) is adopted. Such development is expected to be the exception rather than the rule and will not result in impacts significantly different from those described under Alternative I-1.

Existing regulations and laws designed to reduce adverse impacts of offshore oil and gas development are assumed within the analysis. See Sections I.B.4. and 5. for a discussion of these laws and regulations. In addition, lease stipulations have previously been employed in the OCS lease sales. These stipulations are not assumed to be in place for the purpose of the analysis of impacts. These potential stipulations have been employed in specific cases in the past to further assure protection of unique resource (Cultural Resources and Biological Stipulations), protection against loss of life, property and livelihood (Geological and Military Stipulations), holding the U.S. government harmless (Military Stipulation), and general protection to the environment (Transportation Stipulation). In addition to the functions described above, the use of the stipulations may result in a slightly reduced probability of oil spills (Transportation and Geological Stipulations) and thus result in a reduced expectation of negative impacts. A Secretarial decision on appropriate application of stipulations and other discretionary mitigation measures will be made prior to each lease sale.

1) General Impacts

a) Impacts on Coastal Ecosystems

Coastal ecosystems potentially affected by the proposed lease sales, regardless of the leasing schedule adopted, include mangroves, saltmarsh, brackish marsh, fresh marsh, bays, lagoons, and estuaries. About 1,192 miles of coastline contain some 865 miles (72%) of coastal wetlands. These wetlands perform such important biological functions as storm buffers for inland areas, detritus production, and nursery and feeding areas for many aquatic organisms.

Causes of impacts are the results of the construction of onshore facilities and crude oil spills from exploration, production, transportation, and storage. Based on the estimates for the occurrence of oil and gas in the South Atlantic, it is not expected that oil or gas pipelines will be constructed under any of the alternatives discussed in this FEIS.

The effects of crude oil spills on coastal ecosystems have received considerable attention. Important variables include the amount and toxicity of the crude, the degree of weathering the crude has undergone prior to contacting a coastal ecosystem, the ecosystem type or types contaminated by the crude (i.e., marsh, beach, estuary, mangrove, etc.), the climate and weather of the spill site, the water depth and suspended sediment load, the cleanup method attempted and previous exposure to oil spills.

The above variables will determine the degree of damage and the recovery time for a particular coastal spill.

Oil reaching estuaries or marshes may have its most serious biological effects there. Because estuaries tend to act as nutrient traps, estuarine organisms can be exposed to long periods of contamination. Since many of these organisms are living at or near the limit of their tolerance range, mortality could be high. *Spartina* ssp. of the East and Gulf coast salt marshes have been shown to withstand moderate single doses of hydrocarbons but continuous applications prove lethal because the oil kills the roots and rhizomes. All marsh plant species would probably be most affected by a spill during growing season, when the oil could influence flowering, vegetative reproduction, and seed development. In all coastal environments, oil spilled from onshore transportation or treatment activities may contaminate soil, vegetation, or shoreline. These spills may enter storm sewers and finally reach marine waters, where their deleterious effects have been previously described.

The levels of impacts to coastal ecosystems depend on the magnitude of an individual oil spill and on the frequency of spills contacting these habitats. If a spill does contact coastal wetlands, losses of marsh vegetation, mangroves, and other biologically productive habitats will be high and may be relatively long-term. For the South Atlantic the highest probability of an oil spill contacting land within 10 days, if a spill were to occur, is 26%; and the highest expected number of oil spills occurring over the expected production life of the lease is two.

Conclusion Localized severe and possibly long-term adverse impacts on coastal ecosystems will result if oil spills contact wetlands. The likelihood of such events is low, however. Therefore, the overall levels of expected impacts will be moderate.

Cumulative Impacts In the unlikely event that all tracts offshore the South Atlantic are leased and developed during the life of the proposal, the expected number of oil spills greater than 1,000 bbl is five and the expected number of oil spills greater than 10,000 bbl is three. Additionally, ten oil spills greater than 1,000 bbl and six oil spills greater than 10,000 bbl are expected to result from import tankering of crude oil. An unknown number of oil spills are expected to occur as a result of oil and gas activities in state-owned coastal areas. Although unlikely, the possibility exists that a relatively large oil spill contacting wetlands would be followed by another one in the same area. The cumulative effects of successive oil spills on coastal ecosystems are expected to be moderate and could be relatively long-term.

Vessel traffic will cause erosion of coastal waterways and will contribute to irreversible loss of coastal wetlands. Commercial fishing vessel traffic will have greater impact concerning marsh loss than does oil/gas related vessel traffic.

Natural subsidence, urbanization and construction projects, and the dredging and maintaining of coastal waterways contribute significantly to long-term cumulative impacts on coastal ecosystems.

Alternative I-1 contributes less than 13 percent of the oil spills greater than 1,000 bbl, less than 11 percent of the oil spills greater than 10,000 bbl, and probably less than 20 percent of the oil/gas vessel traffic, but does not contribute significantly to the other impact agents discussed above.

Although the non-OCS-related impact agents have a greater level of impact on coastal ecosystems, the contribution of Alternative I-1 to cumulative impacts on coastal ecosystems is moderate whether all resources offshore the South Atlantic are leased and developed or only the resources described for Alternative I-1 are developed.

b) Impacts on Water Quality and Supply

(1) Offshore Water Quality

Drilling fluids, drill cuttings, deck drainage, and sanitary wastes will be discharged into the marine environment during development of the areas to be leased under the proposed schedule. It is estimated that during drilling operations a well could discharge about 90 barrels of drilling muds and about 17 yds^3 of drill cuttings per day. During the production phase a well would discharge from 1,000-1,400 barrels of formation water each day. Deck drainage and heating and cooling waters discharged from a platform amount to about 90 gallons per day. Sanitary and domestic wastes discharged from a platform range from 1,000-5,500 gallons per day. For the South Atlantic, 339 wells would discharge a total of 30,510 barrels of drilling muds and 5,763 yds^3 of drill cuttings each day during drilling operations. During the production phase, these 339 wells would discharge from 339,000-474,600 barrels of formation water each day. The 11 platforms would discharge about 2,090 gallons of deck drainage and heating and cooling waters and 11,000-60,500 gallons of sanitary and domestic wastes each day. The impact of these discharges on the offshore marine environment is expected to be minimal, since the quantities involved are small in comparison to the massive volume of sea water in the area of discharge which will dilute the pollutants. Pipeline burial will result in a temporary increase in turbidity and possible impact on the water quality if toxic metals, pesticides, and other organic and inorganic compounds are resuspended. The effects of open ocean oil spills (2 spills of 1,000 barrels or greater can be expected to occur over the life of the field) will probably be temporary. Pipeline ruptures or breaks could result in nearshore spills. Nearshore spills affecting estuaries or semi-enclosed bays could cause severe, local degradation of the water quality. Chronic spills from platforms and the discharge of formation waters will result in minor increases of the hydrocarbon levels, and possibly trace metal concentrations in the water column.

Conclusion Overall, there will be a moderate to severe degradation of water quality within a few meters or tens of meters of the discharge site at each platform or rig. However, regional offshore water quality is not expected to be measurably degraded as a result of OCS activities resulting from the proposed sale alternative, and impacts are expected to be very low.

Cumulative Impacts In the unlikely event that all tracts offshore the South Atlantic are leased and developed during the life of the proposal, the expected number of oil spills greater than 1,000 bbl is five and the expected number of oil spills greater than 10,000 bbl is three. Additionally, ten oil spills greater than 1,000 bbl and six oil spills greater than 10,000 bbl are expected to result from import tankering of crude oil. An unknown number of oil spills is expected to occur as a result of oil and gas activity in state-owned coastal areas.

Eleven platforms and 339 wells are estimated for this area with all federal OCS resources developed. Currently, there are no oil and gas structures in state waters, but an unknown number of additional structures may be built as a result of resource development in state-owned coastal areas. Effluents and discharges from these structures will have a low impact on the regional offshore water quality.

Non-OCS related vessel and tanker traffic will add pollutants to the offshore waters probably to a greater degree than oil and gas activities for this alternative.

Alternative I-1 contributes less than 13 percent of the oil spills greater than 1,000 bbl, less than 11 percent of the oil spills greater than 10,000 bbl, and probably less than 20 percent of the oil/gas vessel traffic, but does not contribute significantly to the other impact agents discussed above. Since the non-OCS-related impact agents have a greater level of impacts on offshore water quality, the contribution of Alternative I-1 to cumulative impacts on the offshore water quality is very low, whether all resources offshore the South Atlantic are leased and developed or only the resources described for Alternative I-1 are developed.

(2) Onshore Water Quality and Supply

Changes in population and industrial activity as a result of the possible discovery of oil and gas resources in the proposed lease sale areas will induce changes in onshore water quality, and will place demands on local freshwater supply systems. During the construction of onshore facilities such as gas processing plants and operations bases, temporary water pollution from nonpoint sources would occur due to runoff from the construction sites. The operation of a gas plant produces some water pollutant effluents, but the technology exists to reduce the water quality impacts of a gas processing plant to acceptable levels as determined by permitting requirements. Only one new gas processing plant is expected to be needed as a result of this proposed action.

In many onshore areas the principal source of OCS-induced growth in water requirements would be the population increase caused by the growth in employment opportunities. The importance of this impact will vary with local conditions, but it is not expected to be severe since population changes in most areas will be only a small percentage of the existing population. Additional water requirements will be created at the OCS-related facilities themselves. Operations bases will require about one million gallons of fresh water (largely nonpotable) for each exploratory or development well which is drilled. This water is transported to the platforms by supply boats and is used for mixing with drilling muds. Gas processing plant water requirements vary widely depending on the volume of gas processed and the type of cooling system used. Once-through cooling systems use large amounts of water (fresh or brackish) and would not be used where water supply is a problem. Cooling towers use about .0015 gallons per cubic feet of gas processed, and closed cooling systems consume no significant amount of water. The type of cooling system used would depend upon feasibility in light of local water supply conditions. In general, however, it is expected that properly designed and sited OCS-related facilities would cause only a minimal to moderate water supply impact.

Conclusion Onshore water pollution impacts are estimated to be small and localized as a result of the proposal. State and federal water pollution control regulations will mitigate potential adverse impacts. Water supply requirements will be increased by only a small amount as a result of population increases; however, localized low to moderate impacts to water supply may occur as a result of onshore facility siting. The extent of impacts to both water quality and supply will depend to some extent on specific facility locations and the local availability of water.

Cumulative Impacts In the unlikely event that all tracts offshore the South Atlantic are leased and developed during the life of the proposal, only one new gas processing plant is expected to be built. An unknown amount of growth in water requirements would result from an increase in employment. Both industrial and domestic water supply would have to be increased due to population increase. Offshore operations would require about one million gallons of fresh (nonpotable) water for each well drilled.

OCS oil and gas related population increases and the attendant increase in water demands and water pollution are but a small percentage of the normal population increase and industrial growth of the area.

Since the non-OCS-related impact agents have a greater level of impact on the onshore water quality and supply, the contribution of Alternative I-1 to cumulative impacts on these parameters are expected to be low to moderate, whether all resources offshore the South Atlantic are leased and developed or only the resources described for Alternative I-1 are developed.

c) Impacts on Shipping and Navigation

The major impacts to shipping and navigation that can be expected to occur as a result of OCS oil and gas activities would stem from the construction of

offshore structures on the OCS during development and production phases. Navigation or operation errors in the vicinity of these structures may result in collisions. Impacts which result from any such collision include injury, loss of life, spillage of oil and release of debris, including all or part of a rig, platform, or ship. The release of a ship's cargo may present a serious threat to the environment if the cargo were a toxic chemical, crude oil, or refined oil product.

It is expected that during the first phases of oil and gas exploration there will be a slight negative impact on ship traffic which will be short term in nature until vessel traffic adjusts to new structure location. Some conflicts may arise with vessel movements in the vicinity of major traffic areas. Additional numbers of industry service boats, barges, and drilling and mud ships will not be traveling in the customary traffic patterns of open water shipping. This expected increase of oil and gas related vessel traffic and their patterns of movement will increase the probability of collision in areas within/across existing lanes of vessel traffic.

During exploration and production phases of oil and gas development service vessels traveling between the coast and offshore sites during normal supply and work crew transport would result in an increase in ship traffic in the area's harbors, traffic lanes and the offshore region. Slow moving vessels engaged in trenching and pipe laying activities would also be operating in the area during the development phase. Pipeline construction operations, involve a lay barge, one to three tugboats, and several pipe supply vessels. Impacts would be limited to the time required to lay the pipeline, and prior knowledge of the precise location of the pipeline laying operations at a given time would enable each vessel to avoid this ongoing work. Trips by service vessels will continue throughout all phases of OCS operations. However, as exploratory and development related activities decline, associated material transport and service trips will also decline. The remaining production related trips, worker transport, supply and service, will become routine. These trips will be primarily directed between onshore operations bases and offshore production areas.

To minimize shipping conflicts in the South Atlantic area Traffic Separation Schemes (TSS) have been implemented by the Coast Guard and recognized by the Intergovernmental Maritime Consultative Organization (IMCO) to aid in the prevention of collisions in the vicinity of major harbors. An additional vessel control scheme has been proposed by the Coast Guard and is under consideration by the Army Corps of Engineers. Termed Port Access Routes (PAR's), these navigation lanes would extend seaward from the present termination of the traffic separation lanes of the TSS system out to the 1000 fathom contour. The concept would consist of four parallel lanes, two of which would be used for traffic (one for inbound and one for outbound vessels) for a period of two years. The area crossed by the other two lanes of the system would be available for OCS development including the siting of exploratory rigs during the period. At the end of the two years the lanes would reverse allowing exploration activity in the lanes previously restricted to ship traffic.

It is not possible to predict with any confidence the probability of collisions with OCS related structures and vessels in frontier areas. In the South Atlantic no structures presently exist and little exploratory vessel activity has taken place.

The introduction of OCS activities certainly increases the probability of traffic interruptions, conflicts, and collisions. Further, it is likely that this probability is even higher in certain areas with existing high levels of vessel traffic, e.g., the inlet to Chesapeake Bay, or the St. Johns River.

Conclusion Conflicts will be minimal and impacts will be very low.

Cumulative Impacts In the unlikely event that all tracts offshore the South Atlantic are leased and developed during the life of the proposal, there will still be no significant conflicts with shipping and navigation. The major impacts to shipping and navigation that could be expected to occur as a result of OCS activities would stem from the construction of offshore structures on the OCS and support vessel traffic.

There are currently no offshore oil/gas structures in the South Atlantic. Eleven platforms and 339 wells are planned on the basis of this proposal.

Commercial vessel traffic presents the major source of potential shipping and navigation hazards. Current collision and accident rates are low but will increase in frequency and severity during the life of the proposal, regardless of oil/gas activities, solely due to the expected increase in commercial shipping.

Since the non-OCS-related impact agents have a greater level of impact on navigation and shipping on of the OCS, the contribution of Alternative I-1 to cumulative impacts on these parameters are expected to be very low, whether all resources offshore the South Atlantic are leased and developed or only the resources described for Alternative I-1 are developed.

d) Impacts on Other Uses of the OCS

Potential impacts to commercial fishing and to recreational use of the OCS, as well as conflicts with other management plans for the OCS, are discussed in Section V.D.3.a.

(1) Military Uses

A substantial portion of the water and air space off the east coast of the United States is used for various military operations. High density operations are conducted on a daily basis in some sectors, particularly offshore at Norfolk, Virginia; Kings Point, Georgia; and Jacksonville, Florida. In the South Atlantic warning areas, activities may include the firing of live weapons: air-to-air, air-to-surface, surface-to-air, and surface-to-surface tests and operations, submarine and warship maneuvers. Appropriate OPAREA manuals and instructions delineate the major areas and type of activity permitted within each. The military operating areas are also detailed in the U.S. Coast Pilot series and map published by the National Ocean Survey (NOS). Weekly "Notice to Mariners" delineate the projected use of the areas.

A large area of the OCS adjacent to NASA's Kennedy Space Center is given to restricted use during periodic spacecraft and missile launches and during missile impact and recovery.

In the South Atlantic, four stipulations are applied to oil and gas leases: "Hold Harmless", "Electromagnetic Emissions", "Operational", and "Ordnance." These stipulations minimize the potential conflicts that may occur between military use and oil and gas development. Within a 195 mile range of Kennedy Space Center, an "Evacuation" stipulation is applied to all leases. This stipulation eliminates any conflict between lessees and missile launching and recovery within the probable impact zone of the launch site.

Conclusion The potential for conflict between the military and oil and gas development is highdue to the extensive area covered off the South Atlantic coast by military warning areas, and by the intensive use of several areas for testing, training, and maneuvers. Intensive use of the Kings Point, Georgia, submarine installation, and of the Norfolk naval base and shipyards may bring oil and gas platforms, services operations, and other exploration and development activities into conflict with military operations. Conflicts will be mitigated in all areas by the stipulations attached to the leases; by a mutual cooperation of industry and the military to adhere to the stipulations, to plan missions and maneuvers to avoid oil and gas development; and by area selection.

Cumulative Impacts In the unlikely event that all tracts offshore the South Atlantic are leased and developed during the life of the proposal, there could be significant conflicts with other uses on the OCS.

The principal other uses of the OCS consists of military uses, communication cables, commercial fishing, and recreational use of the OCS.

There are currently no offshore oil/gas structures in the South Atlantic, and only 11 platforms and 339 wells are being planned for the life of the proposal. Oil/gas activities have the potential to interfere with military operations; however, military warning areas, restricted use areas, and appropriate stipulations minimize potential conflicts. There exists some potential for interference and/or conflict with communication cables, but in all cases oil/gas related activities present a very small proportion of OCS traffic potentially interfering with other uses on the OCS.

While the non-OCS-related impact agents have a greater level of impact on other uses of the OCS, thecontribution of Alternative I-1 to cumulative impacts on these parameters should be no different, whether all resources offshore the South Atlantic are leased and developed or only the resources described for Alternative I-1 are developed.

e) Impacts on Land Use

Primary impacts on land use will result from demands for facilities necessary for the exploration, development, production, and transportation phases of OCS oil and gas activity. These activities will alter the existing land use characteristics indicated in Sections IV.A.5. and IV.B.5. New facility sitings are expected to be in accordance with IPP transportation plans; federal, state, and local regulations and permitting procedures; and CZM consistency requirements, where applicable, all of which will mitigate impacts. Impacts could also be lessened if OCS facilities were located in industrially zoned areas. The state of Florida has indicated that facilities should locate at industrial sites, where possible. Any secondary impacts will result from land demands for housing, schools and recreation sites to accommodate additional population which is generated in direct proportion to the amount of new resident employment that occurs. (See following section on Socioeconomic Factors.)

A discussion of the characteristics of onshore facilities in terms of their operation and land use requirements appears in Section IV.A.4.; a discussion of the estimated number and kinds of facilities relative to each alternative is given below.

(1) Service or Support Bases

Service bases are essentially port facilities with dockside space, warehousing, open air storage space, and a small amount of office space required. Most bases occupy approximately 5-10 acres of land.

The amount of land and marginal wharf required for temporary service bases could be provided by existing facilities without causing significant conflicts or competition with other port and harbor activities in the potential onshore development areas. Long-term usage as operations bases is considerably greater and may result in full utilization of dockside land in some ports, and may require the development of additional land and marginal wharfs in other ports. Total land requirement for other OCS oil and gas activities/facilities are relatively small (240 acres). It is assumed that any additional facilities will be located and constructed in accordance with local land use, environmental, and other regulations so that land use conflicts or competition problems will be low.

The South Atlantic has a small infrastructure of OCS-related activities at Savannah and Brunswick, Georgia. Others have been proposed for Morehead City and Southport, North Carolina, and Georgetown and Charleston, South Carolina. It is probable that the existing service bases will be

sufficient to supply the needed services, or that they could be expanded; however, if a temporary base is required there will be very low impact to land use because of existing regulation and permitting requirements. The change in existing land use will be one temporary service base utilizing 6-14 acres.

(2) Pipeline Landfalls

No pipelines are expected in the South Atlantic region because of the small amount of resources estimated for the region. Oil/gas would only be produced if it is economically feasible to do so. There are no existing OCS landfall pipes in the South Atlantic region; however, the most likely landfall sites would be in Carteret, New Hanover, Charleston, Chatam, Glynn, Duval or Broward counties.

(3) Gas Processing Plants

Gas processing plants are constructed along pipeline routes between landfalls and existing transmission lines. A large plant processing one billion cubic feet per day would require about a 75-acre site. If the plant was located in an industrial area near a population center, incoming and outgoing gas lines may have to be odorized, and screening techniques may have to be utilized to minimize these conflicts.

Should a plant be required, 50-75 acres of land would be utilized. The most likely siting for a plant is the same as where the pipeline landfall ultimately occurs. Likewise, a plant can be sited away from coastal areas to eliminate impacts in the coastal areas.

(4) Marine Terminals

A tanker or barge terminal may be utilized to transship oil transported to shore for subsequent shipping to other regions. If separation has not taken place offshore, a partial processing facility could be located in conjuction with the terminal. A waterfront site, preferably industrial, would be required, with a water depth of 35 feet. While the site could occupy over a hundred acres, less than 50 acres would probably be intensely utlized; most of this would be for storage tanks.

The possibility exists that no marine terminal will be required due to the low estimates for oil resources in the South Atlantic region. If a terminal is required, the counties of Carteret, New Hanover, Charleston, Chatham, Glynn, Duval or Broward counties are those most likely to be considered as sites.

Conclusion The overall level of impact on land use in the South Atlantic is expected to be very low for Alternative I-1.

Cumulative Impacts In the unlikely event that all areas of the South Atlantic federal OCS are leased and all resources are subsequently developed over the extent of the proposal, the expected level of land use would be approximately 200-400 acres. An unknown amount of land may be used to support nearshore oil/gas development in state waters. Commercial and residential construction within coastal areas, expansion of existing ports to handle commercial imports and coal exports in Savannah, Georgia, and planned construction of refineries in Southport, North Caroline, and Savannah, Georgia, will have a much higher level of impact on land use than OCS-related impacts. The cumulative effect of these developments and ancillary activities is expected to result in a moderate level of impact to land use in the South Atlantic region.

Since other non-OCS-related agents have a greater impact on land use, the contribution of the proposal to cumulative impacts is very low, whether all resources offshore the South Atlantic are leased and developed or only the resources described and Alternative I-1 are developed.

f) Impacts on Cultural Resources

Submerged cultural resources include both historic and prehistoric sites. Historic resources include shipwrecks, sunken aircrafts, and isolated artifacts (e.g., anchors) not located in association with wrecks. Prehistoric resources include aboriginal artifacts (e.g., stone bowls and tools) which may occur singly or in clusters, and occupation sites submerged by rising sea level.

The cultural resource base on the OCS is almost entirely unlocated due both to a lack of surveys and a lack of further investigation of potential sites recorded where surveys have been conducted.

As a result of holding the proposed sales under Alternative I-1, there is a possibility for the destruction or alteration of significant offshore cultural resources due to exploratory rig, platform, and pipeline placements. These activities would also result in tons of new ferromagnetic structures and debris offshore, which would tend to mask magnetometer readings indicating potentially significant cultural resources, should future surveys be attempted. Destruction or alteration of any historic or prehistoric site on the OCS would be highly significant since the type of archaeological information contained in these sites is unique.

Impacts resulting to sites from oil spills would include contamination of sites with oil and physical destruction of sites from cleanup operations.

Most types of historic sites located along the coast are not directly at sea level or are protected by bulkheads or other artificial barriers. Thus, they would not be directly affected by an oil spill, but the aesthetic value of a resource could be temporarily degraded until cleanup operations were completed. Prehistoric sites (both known and unknown) located within or adjacent to low lying areas that are tidally influenced could be permanently impacted by an oil spill that reached shore, contaminating the site with oil and destroying carbon-14 dating potential.

Onshore processing and storage facilities and pipeline construction could cause the potential destruction or alteration of historic and prehistoric cultural resources. However, the probability of this occurring is very remote, as state environmental and regulatory agencies have opportunities to review plans for onshore development related to offshore oil and gas activity prior to construction.

Under Alternative I-1, it is projected that 72 exploratory wells and 247 development/production wells would be drilled, and 11 platforms would be placed in the South Atlantic planning area. It is also projected that, as a result of sales under Alternative I-1, approximately 37-131 acres would be disturbed by the construction of onshore support facilities. The number of oil spills resulting under this alternative for the South Atlantic is projected as two.

Conclusion Due to the largely unlocated cultural resource base, a statement as to the potential for interaction between the impact producing factors and the resource cannot be made. It can only be stated that with an increased amount of development there is an increase in the probability for an adverse interaction. Since, however, any interaction could result in the destruction of unique, irreplacable archaeological information, the unmitigated impacts associated with this alternative are assumed to be moderate.

Cumulative Impacts In the unlikely event that all tracts offshore the South Atlantic are leased and developed during the life of the proposal, the expected number of oil spills is five spills greater than 1,000 bbl and three spills greater than 1,000 bbl. An additional ten oil spills greater than 1,000 bbl and six spills greater than 10,000 bbl are expected to result from import tankering of crude oil. An unknown number of oil spills could occur from development in state tidelands. A total of about 15 oil spills greater than 1,000 bbl are expected; however, it is unlikely that

multiple spills would occur in the same area. The cumulative impact of these oil spills on cultural resources is expected to cause a very high level of local impacts.

About 1,039 exploratory/development wells, 30 platforms, and 2 pipelines are estimated for this area with all federal OCS resources developed. Currently, there are no platforms on the federal OCS and no platforms in state waters. An unknown number of structures may occur as a result of resource development in state tidelands.

Approximately 150-300 acres of land will be required with all federal OCS resources developed. An unknown amount of land could be used to support oil/gas development in state waters. Commercial and residential construction and dredging within coastal areas also could impact cultural resources. The overall cumulative impact of this construction and ancillary activities is expected to result in a high level of impacts on cultural resources in this region.

The proposal contributes less than 13 percent of oil spills greater than 1,000 bbl; less than 11 percent of oil spills greater than 10,000 bbl; less than 33 percent of the wells, platforms, and pipelines; and less than 40 percent of land use. Since the non-OCS-related impacts probably have a greater impact on cultural resources, the contribution of the proposal to cumulative impacts is low, whether all resources offshore the South Atlantic are leased and developed or only the resources described for Alternative I-1 are developed.

2) Impacts of Special Concern

a) Impacts on Commercial Fisheries

Major commercial groups of fisheries resources on the South Atlantic OCS include anadromous fish, coastal sciaenids and herrings, groundfish, migratory pelagics, reef fish, shrimp, and inshore shellfish. In 1980 commercial finfish and shellfish landings for the South Atlantic and Chesapeake were about 1.2 billion pounds worth about $278 million (USDC, 1981). Shrimp is the major cash crop in this area, and harvesting is largely confined to nearshore (less than ten miles from the coast) and inshore waters.

Fishing activities involve the harvesting and marketing of the resource. The ability to harvest the resource can be impacted by competition for shore facilities, labor, and goods; at sea, impacted by space competition such as gear conflicts and associated losses, and area closures, and removal of fishing space. Of the various types of fishing gear in use, towed bottom gear such as trawls and dredges, as well as pots, have the greatest chance for operational conflicts with oil and gas activities. The cost to a fisherman can be substantial from a fouled trawl or dredge. The losses can range from a small time loss required to free the gear to considerable losses of downtime for repairs, replacement of gear, and missed catch. Also, the ability to market the resource may be adversely impacted by tainted shellfish flesh, especially molluscs. Although molluscs are known to depurate, the area contacted by an oil spill will probably be closed to harvesting for at least one fishing season, and perhaps for many years.

Special mitigation through the Fishermen's Contingency Fund is available for fishermen that suffer gear and associated losses on the OCS. Final regulations (50 CFR Part 296) for the implementation of Title IV of the Outer Continental Shelf Lands Act Amendments were published in the Federal Register on January 24, 1989, 45 FR 6062.

Oil spills present the greatest potential impact on South Atlantic fisheries resources. The damage to commercial fishing resources from an oil spill will depend on a number of factors including (1) the amount of oil spilled; (2) how much weathering the oil experiences before contacting fish, larvae, or eggs; (3) how large an area will be impacted; and (4) the toxicity of the oil.

In the South Atlantic, anadromous fishes, reef fishes, and inshore and coastal finfish and shellfish are the most susceptible fishes to potential oil spill impacts. The anadromous fishes are susceptible to oil spills because their critical nursery areas are shallow shore waters and estuaries, and several life stages of these fishes occur here. Such areas are more susceptible to oil spills should one occur in or near them. In any localized area where spills might occur, the effects to be expected would be from loss of larvae, loss of equilibrium, and loss of tendency to school. Studies on eggs and larvae of various fish species have shown that the water soluble fraction of oil can affect the individuals by death, arresting its development, or by deforming the larvae. Reef fishes generally congregate near natural reefs and live bottom areas, and they tend to congregate around structures. This makes them more susceptible to oil spills and other operation discharges. Inshore fisheries, especially shellfisheries, have a high potential for impact because they live in enclosed bodies of water. Many of them, such as the oyster, have nonmotile adult forms and, therefore, cannot evade stressing agents.

If an oil spill should enter an estuary, impacts of various degrees could result. This would depend on the magnitude, extent, and duration of exposure to the spilled oil. A severe case could result in large mortalities of organisms such as oysters, clams, crabs, and larval and juvenile fishes, and could cause relatively long-term damages. The likelihood of this occurrence is low, however.

Functional impairment could also result from uptake of petroleum hydrocarbons. Effects in the estuary can be expected to last from months to years. Should an oil spill strike the coastline, it can accumulate. Effects can be intensified, but probably to a lesser degree than in estuaries. Motile organisms along the coastline have a better chance of avoiding an oil spill than in estuaries where escape routes may be few and a barrier of oil may be present. Oil would be more quickly dispersed along the coastline than in estuaries because of currents and tides, especially in high energy areas. Mortalities and functional impairments to sessile fauna such as clams can be expected. Surf zone fishes will probably be able to avoid the spill and may be temporarily absent from areas of oil concentration. If the spill is extremely widespread, large areas of shoreline could be affected.

For Alternative I-1 the area foreclosed by platforms (11 platforms expected) as percent of fishing area is estimated to be less than 0.001 percent or about 20,000 acres. This is considered to be a very insignificant percentage of the total fishing area, and, consequently, a low impact on overall fishing activity is expected. Some ports are expected to become slightly crowded, and a low impact on fishing activity is expected. The fishing area covered by geologic area is estimated to be from 10-20 percent. Some gear conflicts, as described under Unavoidable Adverse Impacts (V.D.2.a.4)b)), will occur. However, these will be largely compensated through normal legal routes or through the Fishermen's Contingency Fund. The expected number of spills from this proposal is 1.87. Should an oil spill contact the estuarine areas used by finfish and shellfish as nursery grounds or estuarine shellfish harvest areas, high impacts on commercial fishery resources could occur. In that event, there would be high, localized mortality of juvenile commercial finfish and shellfish, habitat destruction, and interference with the actual harvest of these species. Should these areas be contacted repeatedly by one or more spills, a more severe impact would occur on commercial fishery resources. A large oil spill would adversely affect the commercial fishing industry. due to loss of income if important fishing areas would have to be closed during the principal harvest seasons. These adverse impacts would be short term but would have the potential for serious localized economic losses.

Conclusion Moderate impacts are expected for commercial fishing ;however, there could be more severe impacts if a large oil spill should contact major finfish or shellfish nursery grounds or a major shellfish harvest area. The likelihood of the latter event occurring is low, however.

Cumulative Impacts In the unlikely event that all tracts offshore the South Atlantic are leased and developed during the life of the proposal, the expected number of oil spills greater than

1,000 bbl is five, and the expected number of oil spills greater than 10,000 bbl is three. Additionally, ten oil spills greater than 1,000 bbl and six oil spills greater than 10,000 bbl are expected to result from import tankering of crude oil. An unknown number of oil spills are expected to occur as a result of oil and gas activities in state-owned coastal areas. Although unlikely, the possibility exists that a relatively large oil spill contacting estuarine nursery areas would be followed by another one in the same area. The cumulative effects of successive oil spills on estuarine nursery areas are expected to be moderate to high and could be relatively long-term.

Eleven platforms are estimated for this area with all federal OCS resources developed. An unknown number of additional structures may be built as a result of resource development in state-owned coastal areas. The total fishing area that will be lost throughout the planning area from these structures will be very small.

Vessel traffic from existing and future oil and gas activities, gear conflicts, and crowding of ports associated with total development of oil and gas resources may create a moderate to high impact on the commercial fishing industry. The commercial fishing is also stressed for other reasons, such as fluctuations in fish populations, changes in market conditions, and restrictions on finfish and shellfish harvests. These other sources may cause moderate to high economic impacts on the industry. Overall, the expected regional impacts on commercial fisheries due to cumulative impacts from Alternative I-1 are moderate.

The proposal contributes less than 13 percent of the oil spills greater than 1,000 bbl, less than 11 percent of the oil spills greater than 10,000 bbl, and perhaps over one-third of the oil and gas vessel traffic, but does not contribute significantly to the other impact agents discussed above. Non-OCS-related impact agents have a sizable impact on the commercial fishery and the contribution of the proposal to cumulative impacts to these fisheries in moderate, whether all resources offshore the South Atlantic are leased and developed or only resources described for the alternative are developed.

b) Impacts on Endangered Species

The major endangered marine mammals which occur in the South Atlantic region are: the right, fin, humpback, sperm, and sei whales; and the manatee. A discussion of the general impacts on whales is found in the endangered species for the North Atlantic region. Manatees are especially susceptible to collisions with boats in shallow coastal waters because of their slow-moving habits and the confining nature of the coastal harbors, rivers, and channels they normally inhabit. Jacksonville Harbor, Port Everglades, and the southern portions of the Intracoastal Waterway are of concern in this respect.

The major endangered and protected marine reptiles which occur in this region are: Kemp's ridley, leatherback, hawksbill, loggerhead and green turtles; and the alligator. These species could be affected by collisions with boats, oil spills, and onshore construction. Oil spills could affect turtle eggs and hatchlings if a spill coated a turtle nesting beach during incubation (April-July) or when hatchling turtles were leaving the nests (July-August). Coastal construction (pipelines/storage facilities) could disrupt turtle and alligator nesting habitat if constructed during the nesting season.

The major endangered bird species which occur in this region are: brown pelican, bald eagle, and peregrine falcon. These bird species inhabit the coastal area and could be affected by coastal construction and/or oil spills. Most of the potential coastal construction resulting from this proposal will be confined to small areas (pipeline and storage facilities) and little of the habitat utilized by these species are expected to be affected.

A regional endangered species consultation was held with Fish and Wildlife Service and National Marine Fisheries Service (October, 1979) pertaining to South Atlantic OCS Sale Nos. 56 and 78. In the biological opinion of these agencies, with stated conditions, there would be no jeopardy to the continued existence of the endangered and threatened species considered, and no destruction or modification of their critical habitats or habitats likely to be determined as critical in the future, resulting from those proposals.

Alternative I-1 indicates two proposed sales for the South Atlantic region (proposed Sale No. 78 and one additional sale). Increased boat traffic, as a result of this proposal, is expected to have a very low level of impact on manatees and marine turtles in the South Atlantic region. The potential production and transportation of oil resulting from this proposal could result in two spills greater than 1,000 bbl, with a 26 percent probability of contacting shore within 10 days. About 25 percent to 30 percent of the approximately 977 miles of shoreline in the South Atlantic region is potential endangered species habitat and small sections (3-15 miles) of this habitat could be adversely affected by oil spills. The oil spills would have a very low level of impact on local endangered species populations. Onshore facilities constructed as a result of this proposal will require approximately 57-131 acres and is not expected to have a significant effect on endangered species or their habitat.

<u>Conclusion</u> Alternative I-1 in the South Atlantic region will have a very low level impact on endangered species, and is not expected to have a significant adverse affect on endangered species populations in this region.

<u>Cumulative Impacts</u> In the unlikely event that all tracts offshore the South Atlantic are leased and developed during the life of the proposal, the expected number of oil spills is five spills greater than 1,000 bbl and three spills greater than 10,000 bbl. An additional ten oil spills greater than 1,000 bbl and six spills greater than 10,000 bbl are expected to result from import tankering of crude oil. An unknown mumber of oil spills could occur from development in state tidelands. A total of about 15 oil spills greater than 1,000 bbl are expected; however, it is unlikely that multiple spills would occur in the same area. The cumulative impact of these oil spills on endangered species is expected to cause a low level, short-term, local impact.

Vessel traffic from existing and future oil/gas activities may create very low impacts to endangered species. The use of ports and harbors associated with total development of oil/gas resources offshore the South Atlantic (federal and state) are not expected to be significantly different from the impacts described above for the proposal.

Endangered species are also stressed from other sources, such as fluctuations in food resources and weather, pesticides, loss of habitat, and for the manatee, collisions with pleasure boats and drowning in automated flood control structures. Overall, the expected regional impacts on endangered species due to cumulative impacts is low.

Alternative I-1 contributes less than 13 percent of the oil spills greater than 1,000 bbl, less than 11 percent of the oil spills greater than 10,000 bbl, and approximately 20 percent of the oil/gas vessel traffic, but does not contribute significantly to the other impact agents discussed above.

Since the non-OCS-related impact agents would have a greater level of impact on endangered species, the contribution of Alternative I-1 to cumulative impacts on these species is low, whether all resources offshore the South Atlantic are leased and developed or only the resources described for Alternative I-1 are developed.

c) Impacts on Habitats and Resources of Special Concern

Biologically sensitive areas on the South Atlantic OCS are hard bottom areas, where water conditions and depth permit the growth of rich biological com-

munities. Live bottoms are defined as those areas which contain diverse epifaunal assemblages living upon naturally occurring rocky formations. Little specific information is available about these areas, but it is known that these areas are scattered throughout the shelf in a sparse patchy manner, except for a trend of reefs of relatively high relief along the shelf break. Even less is known of the Blake Plateau, although there is evidence that deep water coral communities are present.

These high value biotic communities would be severely damaged if oil and gas operations were to take place right on them. The impacts would be due to two aspects of oil and gas operations. First, the drilling muds and cuttings will settle on the smother the benthic organisms within 100 m or so of the well site, and some constituents of the muds may be toxic to organisms within approximately 25 m of the discharge point. Second, such operations will cause destructive mechanical damage due to anchors, drilling itself, submersible and jack-up rig damage, and the installation of pipelines. While the area of such damage will be small, the areas of unique and productive biota are also small, and thus the damage to those ecosystems will be moderate, but avoidable if the biological stipulations are applied.

Estuarine areas are important due to their role as nursery grounds for many species of commercially important fish and shellfish and as waterfowl habitat. The major impact of concern from the proposal is the potential for oil pollution. Crude oil contamination can render shellfish inedible, cause high mortalities to waterfowl and contaminate bottom sediments. Recovery can take from months to years. The possibility of an estuary suffering a crude oil spill in this area as a result of this proposal is believed to be low.

Conclusion Oil and gas activities on these areas will cause damage to these unique and productive areas. Each well location will impact up to eight acres of benthic habitat. Impacts will be moderate.

Cumulative Impacts In the unlikely event that all tracts offshore the South Atlantic are leased and developed during the life of the proposal, the expected number of oil spills greater than 1,000 bbl is five, and the expected number of oil spills greater than 10,000 bbl is three. Additionally, ten oil spills greater than 1,000 bbl and six oil spills greater than 10,000 bbl are expected to result from import tankering of crude oil. An unknown number of oil spills are expected to occur as a result of oil and gas activities in state-owned coastal areas. About 1,039 exploratory/development wells, 30 platforms, and 2 pipelines are estimated for this area with all federal OCS resources developed. Currently, there are no platforms on the federal OCS or in state waters. An unknown number of structures may be built as a result of resource development in state-owned coastal areas. Although unlikely, the possibility exists that a relative large oil spill contacting estuaries would be followed by another one in the same area. The cumulative effects of successive oil spills on coastal ecosystems and nursery areas are expected to be high and could be relatively long-term. Furthermore, oil and gas operations, successive well blowouts, spillage of drilling muds and cuttings, and the accidental introduction of toxic chemicals into waters close to hard bottom areas over the life of the proposal would cause relatively long-term and high cumulative impacts.

Vessel traffic in the estuaries will cause pollution and erosion of this habitat. Commercial fishing vessel traffic will have greater impacts on the estuaries than does oil/gas related vessel traffic. Natural subsidence, urbanization and construction projects, and the dredging and maintaining of coastal waterways contribute significantly to long-term cumulative impacts on estuaries and nursery areas.

Alternative I-1 contributes less than 13 percent of the oil spills greater than 1,000 bbl, less than 11 percent of the oil spills greater than 10,000 bbl, and probably less than 30 percent of the oil/

gas vessel traffic, but does not contribute significantly to the other impact agents discussed above.

Although the non-OCS-related impact agents have a greater level of impact on habitats and resources of special concern, the contribution of Alternative I-1 to cumulative impacts on habitats and resources of special concern is moderate, whether all resources offshore the South Atlantic are leased and developed or only the resources described for Alternative I-1 are developed.

d) Impacts on Air Quality

A discussion of the primary factors used in assessing onshore air quality impacts which may result from OCS-related activities and the method employed in quantifying the impact on this planning area are described in Section V.A.3. of this document.

Information on nonattainment areas in the planning area is provided in Table V.D.3.a.2)d)-1.

Table V.D.3.a.2)d)-1. Nonattainment Areas Within the Region

State	Area	Nonattainment Pollutants
South Carolina	Charleston Area	TSP, O_3
	Georgetown Area	TSP
Georgia	Savannah	TSP
Florida	Broward, Dade, Duval, Palm Beach Counties	O_3

It is estimated that 72 exploratory wells will be drilled to identify the resources and 267 development/production wells and 11 platforms to develop the resources under this alternative. It was assumed, for the purposes of analysis, that production from an average platform would be 1.2 million barrels of oil and 4.6 billion cubic feet of gas per year. All of the oil produced in the region is assumed to be transported by tanker or barge. Estimated representative emissions for exploration/development are provided in Table V.D.3.a.2)d)-2. This information is derived from Table V.A.3.-1.

Table V.D.3.a.2)d)-2. Estimated Representative Emissions

Activity	Production at Platform (tons per year)				
	VOL	NO_x	TSP	SO_2	CO
oil/gas	6	83	–	0.1	32
barging	40	–	–	–	–

It was estimated that OCS facilities located within 20 miles of the South Atlantic planning area coast would require emission controls. The most probable location of platforms is beyond this 20-mile distance, as this is where the resources are expected. Therefore, the platforms are not expected to require emission controls. One new gas processing plant will be needed as a result of this alternative (see Land Use, Section V.D.3.a.1)e)).

A low qualitative impact is expected from routine emissions. Areas adjacent to likely development are primarily attainment; however, the gas processing plant could cause high impact in the area in which it locates. Because of the distance from shore that the platforms will be sited, offshore emissions would not significantly affect onshore air quality. Also, for this reason, blowouts, oil spills, and fires would likely not impact the onshore air quality unless they lasted for several days.

Any emission sources which would adversely affect the onshore air quality would be subject to mitigation required by EPA and the state, if located onshore, or by DOI, if located on the OCS. ERG (1981) discusses mitigation measures for OCS facilities.

Conclusion The level of expected impacts on air quality resulting from the development of hydrocarbon resources under Alternative I-1 is low.

Cumulative Impacts It is estimated that a total of 1.1 billion barrels of oil and 4.3 trillion cubic feet of gas exist in the entire South Atlantic federal OCS planning area. In the event that total development of all federal reserves occurs over the life of this proposal, 30 new platforms with 762 wells would be required. It is very unlikely that this magnitude of development will occur over the life of this proposal.

The onshore air quality will only minimally be affected by the development activities in this planning area due to the prevailing winds from the west. On infrequent occasions the regional onshore air quality will be impacted by OCS facilities; this impact should be low.

If all the proposed gas processing plants are installed, very high local cumulative air quality impacts will result. If the oil and gas produced as a result of this proposal replaces oil and gas presently being processed in onshore facilities (but coming from decreasing impact sources), no cumulative impact of local air quality would result; production levels at onshore facilities would remain stable with only the substitution of one source of raw product for another source.

Overall, cumulative regional air quality impacts are expected to be moderate; local impacts will range from moderate to very high depending on the level of gas processing plant construction. However, EPA rules associated with the Clean Air Act and the DOI air quality rules have provisions to minimize these impacts.

e) Impacts on Recreation

Water dependent recreation activities are susceptible to severe impacts from marine pollution induced by oil and gas activities. Parks, wildlife refuges and management areas, specially designated areas such as national natural landmarks, National Register sites, beaches and barrier islands, and other shoreline recreation resources that front on the ocean or on bays and estuaries can incur impacts from the construction of pipelines which come ashore, from oil spills, and from the placement of onshore facilities (such as terminals or transfer facilities) should they be located near a recreational area. Additionally, oil and gas activities offshore can visually impact on shoreline resources or contribute non-petroleum floating debris to ocean waters that eventually washes ashore impacting recreation resources and water enhanced recreational activities.

By far the most unpredictable and severe negative impact can result from oil which is released into the marine environment and which finds its way into popular recreation waters or reaches shore, soiling shoreline recreational resources. Oil spills most likely to affect recreational resources and activities could originate from drill site blowouts, production site accidents, near shore or onshore pipeline breaks or leaks, and crude oil transport vessel accidents, or a combination of these causes. The greatest number of recreationists would be affected should an oil slick come ashore on a national seashore or a popular recreation beach where the focus of public use is at the water's edge.

The blowout of a Mexican well in the Bay of Campeche released oil which began washing ashore on Texas barrier island beaches on August 14, 1979. Visitation statistics for Padre Island National Seashore give an indication of the impact of an oil spill on recreation. For an area which received annual visitation of 867,000 in 1978, visitation was down 25.5% in August 1979 over August 1978, and 23.8% in September.

An oil spill impacting a beach area would foreclose its use for recreational purposes for at least the duration of the oil's continuous beaching and any subsequent cleanup period. If a beach area is relatively accessible, cleanup can be accomplished in a matter of days through the mechanical removal of oil soaked sand. Depending on the pre-existing condition of the beach (i.e., degree of erosion), efforts might have to be made to replenish the sand that had been removed by cleanup operations. This could take an extended period of time (possibly months) depending on the availability of sand and/or the requirement to obtain a permit to remove sand from the submerged lands for replenishment purposes. The timeframe of curtailed uses could be extended beyond the period necessary for cleanup and replenishment by the adverse publicity associated with the beaching. The size, seasonality, and beaching location of a spill are other significant factors which influence the magnitude of the recreation opportunities that will be curtailed. Cleanup costs will be mitigated by monies provided by the Oil Spill Contingency Fund (unless liability can be fixed).

Trash (floating and non-organic) improperly disposed of offshore, or debris from accidents offshore can eventually impact the aesthetics of shoreline recreation resources and cause increased maintenance to resource area administrators. Although a minor and intermittent problem, such impacts can be expected.

More predictable and controllable impacts can result from onshore facility requirements such as pipeline alignment, support facility sitings and the aesthetic effects of these type facilities upon people recreating within perceivable distance from these facilities. Careful siting can mitigate these impacts.

Recreation and tourism are very interrelated. Many local coastal economies are heavily dependent on the quality and attractiveness of ocean and bayfront recreation resources. Should recreation areas be impacted to the point of discouraging public use as a result of regional lease sales, a corresponding impact would be noted in the economies of coastal towns and villages. The extent of economic harm which may result from an oil spill affecting recreational resources would be impossible to predict with any degree of specificity because of the importance of the interplay of factors such as spill size, duration, seasonality, locality, etc. However, as an extreme example of the magnitude, it was estimated that the value of recreation foregone by Santa Barbara residents as a result of the 1969 spill there was over $13 million, although diversions to other areas resulted in a negligible overall economic impact to tourism (Mead and Sorensen, 1971).

Lease site activities occurring from 3 to 10 miles of the shoreline may be a source of visual pollution to the sensitivities of some individuals who live or recreate with the ocean horizon as a scenic background. Although nearshore lease site oil and gas operations will have a minor impact on background amenities ,it is unlikely to affect the level or extent of recreational activities currently occurring along the South Atlantic seaboard.

On the positive side there is a demonstrated interest in creating artificial reefs to improve offshore recreational fishing in the South Atlantic Planning Region. Production platforms resulting from oil and gas development will function as excellent artificial reefs attracting fish and fishermen throughout the production life of the structure.

Conclusion Given the preliminary estimates of the resource potential of the South Atlantic Planning Region, three area wide offerings in the South Atlantic between 1983 and 1986 could result in: (1) Approximately one major oil spill in the next 20 years which could lead to short-term disturbances or temporary loss and displacement of water-related nearshore recreational activities from soiling of beaches and recreational areas, and (2) the creation of 11 new artificial reefs a few of which may be close enough to shore to attract sports fishing or detract from shore based visual amenities. Overall level of impact is expected to be low to moderate.

Cumulative Impacts In the unlikely event that all tracts offshore the South Atlantic are leased and developed during the life of the proposal, the expected number of oil spills is five spills greater than 1,000 bbl and three spills greater than 10,000 bbl. An additional ten oil spills greater than 1,000 bbl and six spills greater than 10,000 bbl are expected to result from tankering of imported crude oil. An unknown number of oil spills could occur from development in state tidelands. A total of about 15 oil spills greater than 1,000 bbl are expected; however, it is unlikely that multiple spills would occur in the same area. The cumulative impact of these spills on recreation is expected to cause a moderate level of local impacts.

About 30 platforms and two pipelines are estimated for this area with all federal OCS resources developed. Currently, there are no platforms on the federal OCS and no platforms in state waters. An unknown number of structures may occur as a result of resource development in state tidelands.

Approximately 150-300 acres of land will be required with all federal OCS resources developed. An unknown amount of land could be used to support oil/gas development in state waters. Commercial and residential construction and dredging within coastal areas also could impact recreation. The overall cumulative impact of this construction and ancillary activities is expected to result in a moderate level of impacts on recreation in this region.

The proposal contributes less than 13 percent of oil spills greater than 1,000 bbl, less than 11 percent of oil spills greater than 10,000 bbl, less than 36 percent of the platforms and pipelines, and less than 40 percent of land use. Since the non-OCS-related impacts probably have a greater impact on recreation, the contribution of the proposal to cumulative impacts is low to moderate, whether all resources offshore the South Atlantic are leased and developed or only the resources described for Alternative I-1 are developed.

f) Impacts on Socioeconomic Factors

The conditional mean estimates of resources recoverable from the South Atlantic region as a result of the proposed leasing schedule are 400 million barrels (mmbbls) of oil and 1.51 trillion cubic feet (tcf) of natural gas. Based upon information prepared for the most recent OCS sale in the area, Sale 56, total employment due to these South Atlantic sales is expected to be around 2,300 people. About 75 percent of these employees will be locally hired, which will help reduce areawide underemployment. The remaining 25 percent, or about 600 people will represent new resident employment. New resident population the South Atlantic region will be about 1,400 people in the peak year as new residents move into the area in response to additional employment opportunities. Significant discoveries from Sale 56 (held in 1981) could lessen these impacts by encouraging earlier OCS-related employment and population growth than currently anticipated.

Exploratory drilling on Sale 43 leases was begun in June 1979 and resulted in temporary service bases established in Savannah and Brunswick, Georgia. Additional drilling related to Sale 56 leases is anticipated. If such drilling is successful, these bases may become permanent sites which would also be used in support of the proposed five-year schedule. In addition to these service areas, employment and population growth may occur at Moorehead City, N.C., Wilmington, N.C.,

Charleston, S.C., Jacksonville, Fla., and Port Everglades, Fla. Counties within commuting distance of these centers could receive some minimal impacts from the sales. The low reserve estimates make it unlikely that refineries or platform fabrication yards will be constructed in the region. Offshore activity and onshore service bases will provide the principal OCS-related employment.

Generally, the proposed schedule of sales is not expected to result in significant adverse socioeconomic impacts on such activities as tourism or transportation within the South Atlantic region. This conclusion is based on two conditions. First, the analysis of oil spills for the most recent South Atlantic sale (Sale 56) indicated that the expected number of spills which would contact tourist beaches within 3, 10, or 30 days as a result of that sale would be very low, 0.2 spills or less. Due to this low number of expected spills, the oil spill-related socioeconomic impacts on tourism activity was also expected to be low. Although the region covered by the proposed five year schedule includes more tourist beaches than in the Sale 56 study area, particularly Virginia Beach and central and south Florida beaches, the proposed schedule of sales is expected to result in only 56 percent of the oil that was estimated for Sale 56.

Conclusion The small expected employment and population increase should not create significant infrastructure stresses. The adverse impact of oil spills on tourist beaches as a result of the proposed schedule is expected to be very low. Also, adverse impacts on port activity will be negligible.

Cumulative Impacts In the unlikely event that all tracts offshore the South Atlantic are leased and developed during the life of the proposal, the expected number of oil spills is five spills greater than 1,000 bbl and three spills greater than 10,000 bbl. An additional ten oil spills greater than 1,000 bbl and six spills greater than 10,000 bbl are expected to result from tankering of imported crude oil. An unknown number of oil spills could occur from development in state tidelands. A total of about 15 oil spills greater than 1,000 bbl are expected; however, it is unlikely that multiple spills would occur in the same area. The cumulative impact of these spills on socioeconomic factors is expected to cause a low level of local impacts.

Approximately 150-300 acres of land will be required with all federal OCS resources developed. An unknown amount of land could be used to support oil/gas development in state waters. Commercial and residential construction within coastal areas also could impact socioeconomic factors. The overall cumulative impact of this construction and ancillary activities is expected to result in a low level of impacts on socioeconomic factors.

The proposal contributes less than 13 percent of oil spills greater than 1,000 bbl, less than 11 percent of oil spills greater than 10,000 bbl, and less than 40 percent of land use. Since the non-OCS-related impacts probably have a greater impact on socioeconomic factors, the contribution of the proposal to cumulative impacts is very low, whether all resources offshore the South Atlantic are leased and developed or only the resources described for Alternative I-1 are developed.

3) Impacts on Other Management Plans

Coastal Zone Management: All of the South Atlantic states, except Georgia, have approved CZM (306) programs which review OCS exploration and development plans as well as certain pre-lease activities to ascertain whether federally licensed or permitted activities covered in the plans, and affecting land and water uses in the coastal zone, are consistent with their respective CZM programs

State CZM plans may restrict the placement of pipelines, refineries, or other support facilities in areas of particular environmental concern, and may set standards for their placement elsewhere. However, some provision for their appropriate location is required by the CZM Act, as amended.

In addition to the procedural requirements for coordination and consistency, the federal CZMA established the Coastal Energy Impact Program (CEIP) to help coastal states and local communities better cope with the potential and actual impacts of OCS and other energy development activities. The CEIP includes: grants for planning for social, economic, and environmental consequences of expected energy development; financial assistance for new or improved public facilities and services; and grants to ameliorate damage to recreational or other environmental resources when the responsible party cannot be found or charged with damage.

Marine Sanctuaries: There are four national marine sanctuaries in the South Atlantic planning area (two of these are actually just off the Florida Keys and not strictly in the planning area). One contains the resting place of the U.S.S. Monitor, a Civil War ironclad vessel which sank off Cape Hatteras, North Carolina. No oil or gas operations would take place near this valuable historical resource nor in this small marine sanctuary. The other three marine sanctuaries are Gray's Reef (off Georgia) and Key Largo and Looe Key (Florida Keys). All are small and are primarily intended to protect corals and associated coral reef communities, which would be adequately protected from potential harm due to oil and gas operations by the stipulation discussed in Section IV.A.3.c. Thus, the impacts to these areas from this proposal are considered negligible, the same as discussed in Section V.D.3.a.2)c).

Fisheries Management Plans: There are no fisheries management plans in effect in the South Atlantic south of Chesapeake Bay. However, plans are currently being developed for the following species: snapper-grouper, callico scallop, billfish, and swordfish (with Gulf of Mexico Council). In the Chesapeake area, fisheries management plans are in effect for (1) mackerel, butterfish, and squid fisheries and (2) surf clam and ocean quahog fisheries. Plans are being developed for bluefish and billfish, and scup and sea bass. No significant conflicts are expected between fisheries management plans and oil and gas activities, regardless of the alternative involved.

4) Unavoidable Adverse Impacts

a) Marine Habitats and Resources

In all proposed lease sale areas, minor decreases in primary productivity due to the mortality or functional impairment of plankton, benthic organisms, seagrasses and algae will occur in localized areas of high turbidities generated by drilling fluids disposal and bottom sediments suspended by pipeline laying and burying operations. The possibility exists that toxic materials used in mud mixtures may adversely affect some marine organisms in localized areas when the drilling fluids and cuttings are discharged; such effects will be short-lived.

Disruption will occur if fresh oil spills reach shallow sensitive biological features. Localized and probably selective mortalities, and functional impairment would probably occur, thereby altering the community structure for an unknown but brief period of time.

Adverse low-level impacts could occur to endangered and threatened species of marine mammals and birds. The most serious potential impacts would occur from major oil spills and chronic oil pollution.

b) Commercial Fisheries

Of the various types of fishing gear in use in the OCS areas, towed bottom gear such as trawls and dredges, as well as pots, have the greatest chance for operational conflicts with oil and gas activities. These conflicts are unavoidable in all OCS areas, as these fishing methods are common to all areas. However, losses can be compensated. Trawling operations suffer interference and inconvenience from oil and gas operations in several ways. Trawl nets can become snagged on underwater stubs causing damage or loss of the nets. Pots can also be lost in this manner. In addition, it is conceivable that snags could damage underwater production equipment or pipelines causing a spill of oil and gas. Because safety equipment is installed which shuts in production when a loss of pressure occurs, the likelihood of a major spill resulting thereby is considered very small. Less frequently, large objects which were lost overboard from petroleum industry boats, pipeline lay barges, and platforms are caught by fishing gear resulting in damage to the gear and/or its catch of fish; however, occurrence of this type of incident is low.

Commercial fishermen would probably not harvest fish in the area of an oil spill, as spilled oil could coat or contaminate commercial fish species rendering them unmarketable. This would be another adverse effect to commercial fishing.

Other unavoidable adverse impacts include loss of fishing space caused by installation of unburied pipelines, rigs, platforms or by other OCS-related structures. There may be some localized moderate competition for shore facilities.

Title IV of the OCS Lands Act of 1978, as amended, provides for the establishment of a Fishermen's Contingency Fund to compensate fishermen for losses sustained on the OCS because of oil and gas activities if the losses cannot be attributed to a financially responsible party.

c) Coastal Habitats and Resources

For the South Atlantic planning area, the highest probability of an oil spill contacting land within 10 days, if one were to occur, is 26 percent; and the highest expected number of oil spills occurring over the expected production life of the lease is 1.87. If an oil spill does contact coastal wetlands, adverse environmental impacts will be high. The entire coastline of this planning area, some 1,192 miles, can be affected by oil spills. Approximately 865 miles, or 72 percent, of this coastline consists of coastal wetlands and is, therefore, susceptible to high adverse environmental impacts if oil contacts this habitat.

Beaches, barrier islands, wetlands, and other coastal ecosystems are located throughout the areas encompassed by the proposed sales. If any of these coastal areas are contaminated by oil, an undetermined amount of fish and wildlife habitat (primarily birds) will be damaged. It is possible that a large number of deaths, particularly to birds, fish larvae, and shellfish, would occur should a large spill reach shore.

The unavoidable short-term impacts associated with trenching and backfilling for pipeline construction include the uprooting of all plants and nonmotile animals in the path of the pipeline, thereby leaving a barren strip 9 to 12 meters wide. Some unavoidable damage may also be rendered to vegetation in adjacent areas by machinery used in the operation. The long-term impacts could include saltwater intrusion, changes in floral and faunal components, and a possible increase in marsh erosion if a canal is not backfilled.

In the event of an onshore oil pipeline leak or spillage at onshore facilities, it is inevitable that the vegetation would be affected to an extent that would be dependent upon the severity of the spill. While a small leak may do little damage, a severe leak may contaminate the substrate and kill the vegetation that comes into direct contact with the oil requiring several years for recovery. Small animals in contact with the oil would probably be killed.

d) Socioeconomic Systems

The migration of labor, capital, and materials to primary impacted areas during the early years of oil and gas operations, and the subsequent out-migration of some of these people and resources during the later years cannot be avoided should the sales take place and if commercially recoverable amounts of oil and gas are found.

When a given area is unable to absorb needed infrastructure expenditure, and economic activity cannot be shifted elsewhere, shortages of supply and dislocations in local economies may result. Problems with allocating the production of goods and services may occur, and consumers within the locality may be affected adversely. Consumption patterns and production patterns would eventually shift so as to remove excess demand, but this adjustment is not immediate and dislocations may be experienced as the local economy works its way to equilibrium. Areas with low population densities and limited industrial bases would be the most likely to experience such adverse impacts.

A condition of uncertainty will also create unavoidable adverse impacts. To the degree that decisions are based on predictions or estimates that prove to be in error over time, adverse impacts will occur to commercial ventures that do not cover their costs. It is not likely that uncertainty could be completely removed from the decisionmaking process. Uncertainty with regard to the level of recoverable resources in the leasing areas, the actions of others, and the economic climate is bound to remain. Private industry and government, while basing their decisions on as much information as possible, will be unable to avoid the adverse impacts caused by uncertainty. Inefficient use of resources could also result from a lack of coordination between the private and public sectors and the improper sequencing of decisions on all levels.

e) Recreation

Adverse impacts on recreation that could be encountered if the proposed South Atlantic sales proceed are: the temporary disruption of recreational areas caused by pipeline burial, the competition for land between recreation and OCS related onshore facilities, the degradation of the aesthetic environment conducive to recreation, and the damage to recreational sites caused by an oil spill. The first three impacts could largely be mitigated through careful site selection and by timing the construction of OCS facilities for the nonpeak season. When an oil spill occurs, the extent of the recreational impact is dependent upon the location and size of the spill, the time of year in which the spill occurs, and the degree of success of cleanup.

A major spill would largely preclude any recreational activity in the affected area. Should oil impact a beach, the recreational use of that beach will be eliminated or dislocated until cleanup procedures have been completed and the beach restored to a desirable, usable state. The use which

the impacted beach would normally receive could be temporarily transferred to surrounding beaches (if available), which might cause crowding and ultimate denial of beach areas to some people. Oil spills could temporarily close marinas and boat launching facilities. This would deny some boaters the opportunity to participate in the activity. The spill could result in bird mortality which could affect hunting activities.

f) Air Quality

The air quality near offshore production sites will be affected should proposed sales included in the five-year schedule proceed. Offshore operations generate a small but significant amount of air pollutants resulting from stationary combustion or from venting produced gas. In most cases, the emissions will be local in nature and quickly dissipated by climate conditions, and there would not be an increase in air quality degradation onshore.

If a natural gas leak or blowout were to occur, air quality degradation would be minimal. Oil leaks and oil spills which would not be accompanied by a fire would introduce highly volatile, low molecular weight hydrocarbons such as benzene and toluene into the atmosphere. These lighter fractions of crude oil would undergo some unknown degree of degradation, possibly resulting in photochemical smog. If a spill were to result in a fire, large amounts of particulate carbon and oxides of carbon, along with smaller but unknown amounts of sulfur oxides, evaporate crude oil liquids, and partially oxidized compounds would enter the air. Local air quality would be severely degraded during the duration of the fire. The extent of degradation cannot be determined, but it is unlikely that it would be high enough to effect land resources or human health.

Air quality will also be unavoidably degraded in the vicinity of onshore transshipment and processing facilities. Through air quality standards and permitting, locations of emissions from these facilities would be tightly regulated. Therefore, adverse impacts are expected to be low.

g) Shipping and Navigation

A certain amount of interference between offshore structures and vessel traffic will occur as a result of the proposed sales in the South Atlantic. This may lead to accidents involving OCS vessels. Several traffic patterns criss-crossing the offshore leasing areas have been traditionally used by oceangoing vessels, but have not been officially established as fairways. There is a low probability of accidents occurring in these heavily used traffic lanes. This low probability is a consideration of experience from other regions where shipping and oil and gas development have co-existed for years. The probability of accidents will decrease over time as shipping becomes familiar with the patten of oil and gas structure placement, the routes of service vessels, and the establishment of the Coast Guard's Port Access Routes (PAR's).

Very little navigational conflict can be expected between ships utilizing established fairways and platforms. However, at night, and especially during rough water, fog, and heavy seas, ships which are not navigating the fairways may collide with fixed structures resulting from these proposed sales. Also, fishing boats engaged in trawling will be inconvenienced by having to navigate around fixed structures located within fishing grounds.

h) Water Quality

Normal offshore operations would have unavoidable effects to varying degrees on the quality of the surrounding water if the proposed sales are implemented. Drilling, construction, and pipelaying would cause an increase in the turbidity of the affected waters for the duration of the activity periods, and, in the case of pipelines, could disturb settled pollutants. A turbidity plume, several hundred yards in length, could also be created by the discharge of drill cuttings and the adherent drilling fluids. This, however, would only affect waters in the immediate vicinity of the rigs. The discharge of treated sewage from the

rigs and platforms would increase the levels of suspended solids, nutrients, chlorine, and BOD in a small area near the discharge points. Chronic spills from platforms and the discharge of formation waters will result in increases of the hydrocarbon levels and possibly trace metal concentrations in the water column. Overall, the effect will be the degradation of water quality around platforms, although the extent of the impact will extend only from a few meters to a few tens of meters from the platform site.

Unavoidable impacts to onshore water quality will also occur as a result of runoff from construction sites of new facilities, but these impacts will be localized in the vicinity of these sites, and of limited duration. Some additional impacts will accrue from increased sewage due to population growth in certain communities. All of these onshore impacts will be mitigated by regulation by state water quality boards acting under existing federal and state regulations and guidelines.

i) Cultural Resources

Coastal prehistoric sites would possibly be contaminated should an oil spill occur. The most serious impact of hydrocarbon contamination would be its effect on C-14 dates obtained from sites in the impacted area. Physical alteration or destruction of sites may also occur as a result of cleanup operations. This impact is probably not significant since only two spills of greater than 1,000 barrels are projected during the life of the wells developed as a result of these sales.
Coastal National Register sites such as forts and lighthouses, as well as numerous coastal historic sites not on the National Register, would possibly be contaminated should an oil spill occur. Physical alteration or destruction of sites may also occur as a result of cleanup operations. This impact is probably not significant since only two spills of greater than 1,000 barrels are projected during the life of the wells developed as a result of this schedule. Oil contamination would only be a temporary impact to most historic sites.

This area has a high concentration of known and unknown historic shipwrecks dating from the early days of European presence in North America, through the Civil War, to more modern times. In addition, there is, as in many OCS areas, the possibility of numbers of submerged prehistoric living sites. Any of these resources not identified prior to bottom disturbing operations such as pipeline trenching, platform placement or anchoring could be damaged or destroyed. In addition, identification of these resources, especially shipwrecks, could lead to looting and the loss of valuable historic data and materials. The activity surrounding the drilling of 72 exploratory wells and the placement of 11 platforms could cause moderate impacts to cultural resources in the planning area.

5) Relationship Between Short-term Uses of Man's Environment and the Maintenance and Enhancement of Long-term Productivity

The principal short-term use of the leased area under the proposed schedule would be for the production of an estimated 400 mmbbls of oil and 1.51 tcf of natural gas, which are nonrenewable resources. This activity would temporarily interfere with tourism in the South Atlantic in the event of a major oil spill contacting popular tourist beaches. The expected number of such spills, however, is low (less than one spill within 30 days). The proposed leasing may also result in onshore development and population increases which may cause very short-term adverse impacts to local community infrastructure, particularly in areas of low population and minimal existing industrial infrastructure. However, these impacts will occur only in the very short run. A return to equilibrium can be quickly expected as population changes and industrial development are absorbed in expanded communities.

After the completion of oil and gas production, oil spills and their impacts will not occur, and the marine environment is generally expected to remain at or return to its normal long-term productivity level. It has been recognized that continuous low-level pollution from toxic chemicals, including oil, may adversely affect long-term productivity. However, to date there has been no discernable decrease in long-term marine productivity in OCS areas where oil and gas have been produced for many years. Areas such as the Atlantic coast, which experienced repeated incidents of oil pollution as a result of tanker groundings during World War II, show no apparent long-term productivity losses, although baseline data do not exist to verify this. In other areas which have experienced apparent increases in oil pollution, such as the North Sea, some long-term effects appear to have taken place. Populations of pelagic birds have decreased markedly in the North Sea in recent years prior to the beginning of North Sea oil production. Until more reliable data becomes available, the long-term effects of the chronic and major spillage of hydrocarbons and other drilling related discharges cannot be accurately projected. In the absence of such data, it must be concluded that the possibility of decreased long-term productivity exists as a result of the proposed action.

In summary, short-term environmental and socioeconomic impacts would result from the proposed leasing schedule, including possible short-term losses in productivity as a result of oil spills. Oil and gas reserves would be lowered. Few long-term productivity or environmental gains are expected as a result of the proposed schedule; the benefits of the leasing schedule are expected to be principally those associated with a medium-term increase in supplies of domestic oil and gas. While no reliable data exists to indicate long-term productivity losses as a result of OCS development, such losses are possible. However, to the extent that OCS development would replace imports of oil which would otherwise be required, such losses as a result of tanker-related oil spills may occur in the absence of the proposal; if this were the case, they would probably be confined to refining centers in the Gulf of Mexico and the mid-Atlantic.

6) Irreversible and Irretrievable Commitment of Resources

a) Mineral Resources

The proposed sales are estimated to result in the production of .40 billion barrels of oil and 1.51 trillion cubic feet of gas. This constitutes an irreversible commitment of these resources. Their development and production for energy and other uses in the short and mid-term will foreclose their availability in the future. Long-term alternate sources for energy are currently being developed, which would provide for sources of energy in the future. Other significant uses of hydrocarbons include manufacture of plastics, synthetic fibers and other synthetic materials, fertilizers, and drugs. Use for manufacture of petroleum products in the future would also be foreclosed by production of these hydrocarbon resources in the 1980's and 1990's.

b) Biotic Resources

An irreversible and irretrievable commitment of biotic resources could occur if areas were subjected to intensive development. Oil spills and chronic low level pollution can injure and kill organisms at virtually all trophic levels. Mortality of individual organisms can be expected to occur, and possibly reduction or even elimination of a few small or isolated populations. The magnitude of these effects are nearly impossible to predict. Section IV.B. identifies the types of impacts which can occur and the resources which are particularly sensitive to adverse impacts resulting from the proposal. Between 57 and 130 acres of habitat could be developed or affected by development of OCS-related facilities. More specific analysis of the flora and fauna which may be impacted, their population levels and dynamics, and potential adverse impacts will be possible in site-specific analyses in sale-related environmental statements.

c) Human Resources

Human casualties can be expected to occur as the result of OCS industry activities. Between 1970 and 1976, there were 102 deaths and 162 injuries directly related to OCS drilling activities. Accidents on rigs and platforms, including blowouts,

helicopter crashes, and boat accidents, can be expected to occur and result in an irretrievable commitment of human resources, despite mitigating measures to improve the safety of OCS operations.

d) Land Resources

An irretrievable commitment of land resources will result from the proposal; however, the use of sites where development exists can reduce or eliminate this commitment of resources. Although the South Atlantic is considered a frontier area, it does have some small facilities which are capable of handling additional services either through utilization of unused capacities or site expansion. It should be noted that unless it is economically feasible to do so, facility sitings will not occur and existing facilities will be utilized from other regions.

e) Economic Resources

Decisions to proceed with sales on the proposed schedule will result in production of goods and services, including investment in required facilities. To the extent that these resources are drawn away from other uses, production of goods and services in alternate locations, or of other types, may be foregone. Steel products, specialized manpower, and capital constitute required resources which may be scarcest.

f) Cultural Resources

Any damage to archaeological or historical sites either known or undiscovered, would result in an irretrievable commitment of nonrenewable resources. Their usefulness as a source of archaeological data would be lost or greatly diminished as a result of oil spills or construction damage.

b. Alternative I-2: The Proposed Schedule with Offerings of Favorable Geological Acreage

This option would retain the streamlining proposal but offer only the acreage of favorable geological acreage. The environmental impacts that would result from this proposal will be essentially the same as those described under Alternative I-1, since the bulk of the analysis for Alternative I-1 was based on the assumption that only development of areas with high resource potential would occur. However, under Alternative I-1 some development may occur outside the high resource potential areas. The impacts that would result from this development would not occur under Alternative I-2.

By limiting areal extent of possible leasing, subsequent environmental studies and analyses could concentrate on areas encompassing the favorable geological acreage. However, as it occurs under the present schedule, some studies and analyses would extend beyond the high potential areas in order to examine all impacts that may result from the schedule.

Restricting leasing to favorable geological acreage also would have the advantage of reducing the area state and local governments have to consider when they plan for OCS activities.

c. Alternative II: The April 1981 Draft Schedule

Under Alternative II in the South Atlantic, the expected level of impacts to resources will be the same as described under Alternative I-1.

d. Alternative III-1: The Current Schedule, the Current System-No Action

The level of expected impacts following the implementation of Alternative III-1 in the South Atlantic (including the Blake Plateau) does not significantly differ from those discussed in Alternative I-1.

THE MORE SIGNIFICANT ENVIRONMENTAL CONSEQUENCES

South Atlantic Resource Category	Level of Expected Impacts 1/ Scheduled Sales Only Under Alternative I-1	Cumulative Impacts of All Activities
1. General Impacts		
a. Coastal Ecosystems	moderate	high
b. Water Quality and Supply		
Water Quality	very low	low
Water Supply	low to moderate	moderate
c. Navigation and Shipping	very low	low
d. Other Uses of the OCS	high	high
e. Land Use	very low	moderate
f. Cultural Resources	moderate	high
2. Impacts of Special Concern		
a. Commercial Fisheries	moderate	moderate to high
b. Endangered Species	very low	low
c. Habitats and Resources of Special Concern	moderate	high
d. Air Quality	low	moderate
e. Recreation	low to moderate	moderate
f. Socioeconomic Factors	very low	low

1/ Definitions of levels of impact are located at the beginning of Section V.D.

(This table also applies to Alternatives I-2, II, III-1, III-2, and IV. See text.)

The estimated hydrocarbon resources for Alternative III-1 in the South Atlantic (including the Blake Plateau) are as follows: 0.24 billion barrels of oil and 0.81 trillion cubic feet of gas. Infrastructures expected to be used to explore and develop these resources include 54 exploratory wells and 1 platform. The predicted oil resources and infrastructure for Alternative III-1 are approximately 60 percent less than those predicted for Alternative I-1. Gas resources are about 53 percent less than Alternative I-1 estimates. It is expected that one oil spill greater than 1,000 bbl and one oil spill greater than 10,000 bbl (production plus transportation) will occur following the implementation of Alternative III-1.

Again, expected oil spills are about 57 percent less than that described for Alternative I-1. The predicted resources, infrastructure, and oil spills for Alternative III-1 are about 40 percent less (exploratory wells will be 33 percent less) than those predicted for Alternative I-1. Although the resources, infrastructures, and oil spills are less in Alternative III-1, significant differences in impacts cannot be differentiated from those described in Alternative I-1. However, it should be stated that the level of impacts for Alternative III-1 is based on only one sale in the South Atlantic, while Alternative I-1 is based on two sales.

e. Alternative III-2: The Current Schedule with Larger Offerings

The estimated hydrocarbon resources for Alternative III-2 in the South Atlantic (including the Blake Plateau) are as follows: 0.31 billion barrels of oil and 1.09 trillion cubic feet of gas. Infrastructures expected to be used to explore and develop these resources include 66 exploratory wells and 8 platforms. The predicted oil resources and infrastructure for this alternative are approximately 20 percent less than those predicted for Alternative I-1. Gas resources are about 28 percent less than Alternative I-1 estimates. It is expected that one oil spill greater than 1,000 bbl and less than one oil spill greater 10,000 bbl will occur following the implementation of Alternative III-2. Again, expected oil spills are about 24 percent less than that described for Alternative I-1. The predicted resources, infrastructure, and oil spills for Alternative III-2 are about 30 percent higher (exploratory wells will be 22 percent higher) than those predicted for Alternative III-1. Although the resources, infrastructure, and oil spills are higher in Alternative III-2, significant differences in impacts cannot be differentiated from those described in Alternative III-1.

Therefore the level of expected impacts following the implementation of Alternative III-2 in the South Atlantic does not differ significantly enough to change the impact levels expected on all resources of concern in the discussion of Alternative III-1.

f. Alternative IV-1.a: Delete Seven Alaska Sales, Change the Timing of Others Using Planning Area-Wide Offerings

The impacts from this alternative in the South Atlantic are identical to those described for Alternative I-1.

g. Alternative IV-1.b: Delete Seven Alaska Sales, Change the Timing of Others Offering Favorable Geological Acreage

The impacts from this alternative in the South Atlantic are identical to those described for Alternative I-1.

h. Alternative IV-2.a: Delete All Arctic Planning Areas from the Schedule While Using Planning Area-Wide Offerings

The impacts from this alternative in the South Atlantic are identical to those described for Alternative I-1.

i. Alternative IV-2.b: Delete All Arctic Planning Areas from the Schedule While Offering Favorable Geological Areas

The impacts from this alternative in the South Atlantic are identical to those described for Alternative I-1.

4. Eastern Gulf of Mexico Planning Area

a. Alternative I-1: The Proposed Schedule with Planning Area Wide Offerings

The description of the proposal, Alternative I-1, is provided in Chapter III of this document. The data on estimated oil and gas resources, the statistically expected number of oil spills associated with the development of the resources, and the infrastructure required for resource development are discussed in the subsections below as appropriate for the individual resource categories.

1) General Impacts

a) Impacts on Coastal Ecosystems

Eastern Gulf coastal ecosystems potentially affected by the proposed lease sales, regardless of the leasing schedule adopted, include saltmarsh, brackish marsh, fresh marsh, bays, lagoons, and estuaries. About 863 miles of coastline contain some 553 miles (64 percent) of coastal wetlands. The following counties bordering the Eastern Gulf contain coastal wetlands: Dade, Monroe, Collier, Lee, Charlotte, Sarasota, Manatee, Hillsborough, Pinellas, Pasco, Hernando, Citrus, Levy, Dixie, Taylor, Jefferson, Wakulla, Franklin, Gulf, Bay, Walton, Okaloosa, Santa Rosa, Escambia and Baldwin. These wetlands perform such important biological functions as storm buffers for inland areas, detritus production, and nursery and feeding areas for many aquatic organisms, including valuable commercial and sport fish species.

Causes of impact stem from construction of pipelines and onshore facilities, or crude oil spills from exploration, production, transportation or storage.

The effects of crude oil spills on coastal ecosystems have received considerable attention. Important variables include the amount and toxicity of the crude, the degree of weathering the crude has undergone prior to contacting a coastal ecosystem, the ecosystem type or types contaminated by the crude (i.e., marsh, beach, estuary, mangrove, etc.), the climate and weather of the spill site, the water depth and suspended sediment load, the cleanup method attempted, and previous exposure to oil spills. The above variables will determine the degree of damage and the recovery time for a particular coastal spill.

Oil reaching estuaries or marshes may have its most serious biological effects there. Because estuaries tend to act as nutrient traps, estuarine organisms can be exposed to long periods of contamination. Since many of these organisms are living at or near the limit of their tolerance range, mortality could be high. *Spartina* spp. of the East and Gulf coast salt marshes have been shown to withstand moderate single doses of hydrocarbons but continuous applications prove lethal because the oil kills the roots and rhizomes. All marsh plant species would probably be most affected by a spill during the growing season, when the oil could influence flowering, vegetative reproduction, and seed development. In all coastal environments, oil spilled from onshore transportation or treatment activities may contaminate soil, vegetation, or shoreline. These spills may enter storm sewers and finally reach marine waters, where their deleterious effects have been previously described.

The levels of impacts to coastal ecosystems depend on the magnitude of an individual oil spill and on the frequency of spills contacting these habitats. If a spill does contact coastal wetlands, losses of marsh vegetation, mangroves, and other biologically productive habitats will be high and may be relatively long-term. For the Eastern Gulf, the highest probability of an oil spill contacting land within 10 days, if a spill were to occur, is 9 percent; and the highest expected number of oil spills occurring over the expected production life of the area is 1.5.

Conclusion Severe and possibly long-term adverse impacts on coastal ecosystems will result if oil spills contact wetlands. The likelihood of such events is low; however,; the overall levels of expected impacts will be moderate.

Cummulative Impacts If all tracts offshore the Eastern Gulf are leased and developed during the life of the proposal, the expected number of oil spills greater than 1,000 bbl is 3.4 and the expected number of oil spills greater than 10,000 bbl is 1.8. Additionally, 16 oil spills greater than 1,000 bbl and four oil spills greater than 10,000 bbl are expected to result from import tankering of crude oil. An unknown number of oil spills are expected to occur as a result of oil and gas activities in State-owned coastal areas. Although unlikely, the possibility exists that a relatively large oil spill contacting wetlands would be followed by another one in the same area. The cumulative effects of successive oil spills on coastal ecosystems are expected to be high and could be relatively long-term.

Vessel traffic will cause erosion of coastal waterways and will contribute to irreversible loss of coastal wetlands. Commercial fishing vessel traffic will have greater impact concerning marsh loss than does oil/gas related vessel traffic.

Natural subsidence, urbanization and construction projects, and the dredging and maintaining of coastal waterways contribute significantly to long-term cumulative impacts on coastal ecosystems.

Alternative I-1 contributes less than 44 percent of the oil spills greater than 1,000 bbl; less than 44 percent of the oil spills greater than 10,000 bbl, and probably less than 20 percent of the oil/gas vessel traffic, but does not contribute significantly to the other impact agents discussed above.

Although the non-OCS-related impact agents have a greater level of impact on coastal ecosystems, the contribution of Alternative I-1 to cumulative impacts on coastal ecosystems is moderate whether all resources offshore the Eastern Gulf are leased and developed or only the resources described for Alternative I-1 are developed.

b) Impacts on Water Quality and Supply

(1) Onshore Water Quality and Supply

Changes in population and industrial activity as a result of the possible discovery of oil and gas resources in the proposed lease sale areas will induce changes in onshore water quality, and will place demands on local freshwater supply systems. During the construction of onshore facilities such as operations bases, contemporary water pollution from non-point sources would occur due to runoff from the construction sites. The operation of a gas plant produces some water pollutant effluents, but the technology exists to reduce the water quality impacts of a gas processing plant to acceptable levels as determined by permitting requirements. State and Federal water pollution control regulations will mitigate potential adverse impacts. Water supply requirements will be increased by only a small amount as a result of population growth due to the proposed action, however, localized impacts to water supply may occur as a result of onshore siting of one new gas processing plant. The extent of impacts to both water quality and supply will depend to some extent on specific locations selected for new facilities construction.

In many onshore areas the principal source of OCS-induced growth in water requirements would be the population increase caused by the growth in employment opportunities. The importance of this impact will vary with local conditions, but it is not expected to be severe since population changes in most areas will be only a small percentage of the existing population. Additional water requirements will be created at the OCS-related facilities themselves. Operations bases will require about one million gallons of fresh water (largely non-potable) for each exploratory or development well which is drilled. This water is transported to the platforms by supply boats and is used for mixing with drilling muds. Gas processing plant water requirements vary widely depending on the volume of gas processed and the type of cooling system used. Once-through cooling systems use large amounts of water (fresh or brackish) and would not be used where water supply is a problem. Cooling towers use about .0015 gallons per cubic feet of gas processed, and closed cooling systems consume no significant amount of water. The type of cooling system used would depend upon feasibility in light of local water supply conditions. In general, however, it is expected that properly designed and sited OCS-related facilities would cause only a minimal to moderate water supply impact.

We presently estimate that perhaps one new gas processing plant might be expanded in the Eastern Gulf of Mexico area as a result of this proposed sale alternative. Since some regions of Florida presently recognize a current or projected water supply problem, siting of new facilities will require prudent site selection and coordination with local agencies and authorities to assure availability of necessary water without placing undue demands on water supplies for the area and to avert the potential for a significant, localized adverse impact.

Projected population growth associated with the proposed action is not expected to significantly impact regional population growth trends, so no undue impact to either water quality or water supply is anticipated as a result of population growth resulting from this proposed sale alternative.

Conclusion Onshore water pollution impacts are expected to be low to moderate and localized as a result of the proposal.

Cumulative Impacts If all tracts offshore the Eastern Gulf are leased and developed during the life of the proposal, only one new gas processing plant is expected to be expan An unknown amount of growth in water requirements would result from an increase in employment. Both industrial and domestic water supply would have to be increased due to population increase. Offshore operations would require about 1 million gallons of fresh (non-potable) water for each well drilled.

OCS oil and gas related population increases and the attendant increase in water demands and water pollution are but a small percentage of the normal population increase and industrial growth of the area.

Since the non-OCS related impact agents have a greater level of impact on the onshore water quality and supply, the contribution of Alternative I-1 to cumulative impacts on these parameters are expected to be low to moderate whether all resources offshore the Eastern Gulf are leased and developed or only the resources described for Alternative I-1 are developed.

(2) Offshore Water Quality

Drilling fluids, drill cuttings, deck drainage, and sanitary wastes will be discharged into the marine environment during development of the areas to be leased under the proposed schedule. It is estimated that during drilling operations a well would discharge about 90 barrels of drilling muds and about 17 yds^3 of drill cuttings per day. During the production phase a well would discharge from 1,000 to 1,400 barrels of formation water each day. Deck drainage and heating and cooling waters discharged from a platform amount to about 190 gallons per day. Sanitary and domestic water discharged from a platform range from 1,000 to 5,500 gallons per day. For the Eastern Gulf of Mexico, 408 wells would discharge a total of 36,700barrels of drilling muds and 7,000yds^3 of drill cuttings each day during drilling operations. During the production phase, these 408 wells would discharge from 408,000 to 570,000 barrels of formation water each day. The 11 platforms would discharge

about 2100 gallons of deck drainage and heating and cooling water and 12,000 to 60,000 gallons of sanitary and domestic water each day. The impact of these discharges on the offshore marine environment is expected to be minimal, since the quantities involved are small in comparison to the massive volume of sea water in the area of discharge which will dilute the pollutants. The effects of open ocean oil spills (11 spills of 1,000 barrels or greater can be expected to occur over the life of the field) will probably be temporary. Gathering pipeline ruptures or breaks could result in nearshore spills. Nearshore spills affecting estuaries or semi-enclosed bays could have severe impacts on the water quality. Chronic spills from platforms and the discharge of formation waters will result in increases of the hydrocarbon levels, and possibly trace metal concentrations in the water column.

Conclusion Overall, there will be a moderate to severe degradation of water quality within a few meters or tens of meters of the discharge site at each platform or rig. However, regional offshore water quality is not expected to be measurably degraded and impacts will be very low.

Cumulative Impacts If all tracts offshore the Eastern Gulf are leased and developed during the life of the proposal, the expected number of oil spills greater than 1,000 bbl is 3.4 and the expected number of oil spills greater than 10,000 bbl is 1.8 Additionally, 16 oil spills greater than 1,000 bbl and four oil spills greater than 10,000 bbl are expected to result from import tankering of crude oil. An unknown number of oil spills are expected to occur as a result of oil and gas activity in state-owned coastal areas.

Thirty platforms, 1,039 exploratory/development wells, and two pipelines are estimated for this area with all Federal OCS resources developed. Currently, there are no oil and gas structures in the Federal OCS nor in state waters, but an unknown number of additional structures may be built as a result of resource development in state-owned coastal areas. Effluents and discharges from these structures will have a low impact on the regional offshore water quality.

Non-OCS related vessel and tanker traffic will add pollutants to the offshore water to a greater degree than oil and gas activities for this alternative.

Alternative I-1 contributes less than 44 percent of the oil spills greater than 1,000 bbl; less than 44 percent of the oil spills greater than 10,000 bbl, and probably less than 20 percent of the oil/gas vessel traffic, but does not contribute significantly to the other impact agents discussed above. Since the non-OCS related impact agents have a greater level of impacts on offshore water quality, the contribution of Alternative I-1 to cumulative impacts on the offshore water quality is very low, whether all resources offshore the Eastern Gulf are leased and developed or only the resources described for Alternative I-1 are developed.

c) Impacts on Shipping and Navigation

The major impacts to shipping and navigation that can be expected to occur as a result of OCS oil and gas activities would stem from the construction of offshore structures on the OCS during development and production phases. Navigation or operational errors in the vicinity of these structures may result in collisions. Impacts which result from any such collisions include injury, loss of life, spillage of oil and release of debris, including all or part of a rig, platform, or ship. The release of a ship's cargo may present a serious threat to the environment if the cargo were a toxic chemical, crude oil, or refined oil product.

It is expected that during the first phase of oil and gas exploration there will be a slight negative impact on ship traffic which will be short term in nature, until traffic adjusts to new structure locations. Some conflicts may arise with vessel movements in the vicinity of major traffic areas. Additional numbers of industry service boats, barges, and drilling and mud ships will not be traveling in the customary traffic patterns of open water shipping. This expected increase of oil and gas related vessel traffic and their patterns of movement will increase the probability of collision in areas within/across existing lanes of vessel traffic.

During the exploration and production phase of oil and gas development service vessels traveling between the coast and offshore sites during normal supply and work crew transport will result in an increase in ship traffic in the area's harbors, traffic lanes, and the offshore region. Trips by service vessels will continue throughout all phases of OCS operations. However, as exploratory and development related activities decline, associated material transport and service trips will also decline. The remaining production related trips--worker transport, supply and service--will become standard. These trips will be primarily directed between onshore operations bases and offshore production areas.

The placement of structures on the OCS is presently regulated in all existing and proposed OCS operating areas, and navigation of OCS and non-OCS vessels is regulated seaward of major port areas.

Due to the existing network of fairways in the Eastern Gulf leading to Tampa Bay, Pensacola, and Panama City, traffic coordination and regulation by the U.S. Coast Guard, and the issuance of permits for the erection of structures on the OCS by the Corps of Engineers, vessel to vessel collisions and vessel collisions with OCS structures have been very few. Particularly, in consideration of over 80,000 ships crossing the Gulf waters each year, and the 2500 structures existing on the OCS, the level of probability of a collision is very low. The OCS Lands Act authorizes the Coast Guard to promulgate and enforce marking requirements for rigs and platforms, and OCS Operating Order No. 1 requires identification marking of structures or abandoned subsea objects.

It is not possible to predict with any confidence the probability of collisions with OCS related structures and vessels in frontier areas. In the eastern Gulf no structures presently exist and little exploratory vessel activity has taken place, as in the case of the West Florida Shelf. The introduction of OCS activities certainly increases the probability of traffic interruptions, conflicts, and collisions. Further, it is likely that this probability is even higher in certain areas with existing high levels of vessel traffic, e.g., the approach to Tampa Bay. As a result of the 5 sales of the Eastern Gulf to be held as proposed in this Five-Year Schedule, oil and gas exploration and development will increase vessel traffic in the Eastern Gulf by 4%. The expected increase in vessel traffice into Tampa Bay with a peak number of platforms installed offshore will be less than 5%.

Conclusion With proper enforcement of existing regulations and a continued use of the Gulf's network of established fairways, conflicts will be minimal as they have been in the past and overall impacts will be very low.

Cumulative Impacts If all tracts offshore the Eastern Gulf are leased and developed during the life of the proposal, there will still be no significant conflicts with shipping and navigation. The major impacts to shipping and navigation that could be expected to occur as a result of OCS activities would stem from the construction of offshore structures on the OCS and support vessel traffic.

There are currently no offshore oil/gas structures on the Federal OCS nor in state waters. Eleven platforms and 408 wells are planned on the basis of this proposal.

Commercial vessel traffic presents the major source of potential shipping and navigation hazards. Current collision and accident rates are low but will increase in frequency and severity during the life of the proposal, regardless of oil/gas activities, solely due to the expected increase in commercial shipping.

Since the non-OCS related impact agents have a greater level of impact on shipping and navigation, the contribution of Alternative I-1 to cumulative impacts on these parameters are expected to be very low, whether all resources offshore the Eastern Gulf are leased and developed or only the resources described for Alternative I-1 are developed.

d) Impacts on Other Uses of the OCS

Potential impacts to commercial fishing and to recreational use of the OCS, as well as conflicts with other management plans for the OCS, are discussed in Sections V.D.4.a.3)&4).

(1) Military Uses

Thirty-two million acres or 55% of the water and air space of the Eastern Gulf is used for various military operations. High density operations are conducted on a daily basis in some sectors--particularly offshore of Pensacola, Florida. In all warning areas the activities include the firing of live weapons air-to-air and air-to-sea by aircraft, aircraft tests and operations, flight training, missile testing, and sonar buoy placement. Appropriate OPAREA manuals and instructions delineate the major areas and type of activity permitted within each. The military operating areas are also detailed in the U.S. Coast Pilot series and maps published by the National Ocean Survey (NOS). Weekly "Notice to Mariners" delineate the projected use of the areas.

Explanatory drilling operations, support vessel traffic and platform construction could interfer with the unrestricted use of these training and testing areas. The effect on these military use areas would be a substantial reduction in acreage available to operations and the resulting impacts would be high.

Conclusion The potential for conflict between between military and oil and gas development is high.

Cumulative Impacts If all tracts offshore the Eastern Gulf are leased and developed during the life of the proposal there could be significant conflicts with certain other uses of the OCS and impact levels would be high.

There are currently no offshore oil/gas structures on the Federal OCS or in state waters, and only 30 platforms and 1039 wells are being planned for the life of the proposal. Oil/gas activities have the potential to interfere with military operations, however, military warning areas, restricted use areas, and appropriate stipulations if in place, would minimize potential conflicts. Oil/gas related activities present a very small proportion of OCS traffic portentially interferring with other uses on the OCS.

The contribution of Alternative I-1 to cumulative impacts on these parameters are expected to be high, whether all resources offshore the Eastern Gulf are leased and developed or only the resources described for Alternatives I-1 are developed.

e) Impacts on Land Use

In addition to the primary and secondary impacts discussed for the South Atlantic area, it should be noted that the western and central Gulf of Mexico have an existing and complex industry infrastructure which has evolved over the past 30 years. Production has been declining over the past several years; many of the facilities which are not operating at full capacity could be utilized to meet additional requirements or expansion could occur at existing sites with little impact expected. The eastern Gulf of Mexico has very little infrastucture and is considered a frontier area. The state of Florida has indicated that facilities should be located at industrial sites, where possible. Much of the infrastructure existing in the rest of the Gulf will most likely be ulitized until such time as it proves economically feasible to site onshore facilities on the Florida coast.

Also within this infrastructure, a large, experienced employment base exists which is amenable to job site changes, not only in the Gulf of Mexico but worldwide as well. In many cases workers maintain permanent homes in a community and commute to and from their job sites, even overseas.

(1) Service or Support Bases

The state of Florida has indicated that siting facilities at existing infrastructure sites is desirable. Two new bases and one expansionbase are assumed for this alternative. There are existing bases at Panama City and Port Manatee which are small and could be expanded to meet the increased needs. Additional bases have been proposed at both cities and also at Boca Grande which would bring the total to five. It is unlikely that more than one new temporary base would actually need to be constructed, but for each base which is, between 6-14 acres of land is required. Any sitings which would be developed are required to meet all regulations which would mitigate and minimize the expected impacts.

(2) Pipeline Landfalls

No oil or gas pipelines are proposed.

(3) Gas Processing Plants

No new gas processing plants are proposed, however, the expansion of one existing plant would probably take place. Three gas processing plants are already located in Santa Rosa County and another has been proposed in Escambia, at Pensacola. Any or all of the three plants could have the potential for increased capacity. Plants do not necessarily require coastal areas for sitings and can be sited in inland areas.

(4) Marine Terminals

One marine terminal is assumed for the proposal utilizin 3040 acres of land. According to the FWS report three are proposed for Pensacola, Port Manatee, and Boca Grande. Each of these port cities has the capability of meeting the requirements for terminals. Minimal impact is expected due to regulations and permitting requirements.

Conclusion Any impact which may occur to the land use in the Eastern Gulf is expected to be very low.

Cumulative Impacts In the unlikely event that all areas of the Eastern Gulf Federal OCS are leased and all resources are subsequently developed over the extent of the proposal, the expected level of land use could range from 200 to 400 acres. An unknown amount of land could be used to support nearshore oil/gas development in State waters. Commercial and residential construction within coastal areas and possible expansion of existing ports to handle commercial imports will have a much higher level of impact on land use than OCS related impacts. The cumulative effect of these developments and ancillary activities is expected to result in a moderate level of impacts to land use in the Eastern Gulf region.

Since other, non-OCS-related impact agents have a greater impact on land use, the contribution of the proposal to cumulative impacts is very low whether all resources offshore the Eastern Gulf are leased and developed or only the resources described for Alternative I-1 are developed.

f) Impacts on Cultural Resources

Submerged cultural resources include both historic and prehistoric sites. Historic resources include shipwrecks, sunken aircrafts, and isolated artifacts (e.g., anchors) not located in association with wrecks. Prehistoric resources include aboriginal artifacts (e.g., stone bowls and tools) which may occur singly, or in clusters and occupation sites submerged by rising sea level.

The cultural resource base on the OCS is almost entirely unlocated due both to a lack of surveys and a lack of further investigation of potential sites recorded where surveys have been conducted in accordance with an archaeological stipulation attached to a lease.

As a result of holding the proposed sales under Alternative I-1, there is a possibility for the destruction or alteration of significant offshore cultural resources due to exploratory rig, platform, and pipeline placements. These activities would also result in tons of new ferromagnetic structures and debris offshore which would tend to mask magnetometer readings indicating potentially significant cultural resources, should future surveys be attempted. Destruction or alteration of any historic or prehistoric site on the OCS would be highly significant, since the type of archaeological information contained in these sites is unique.

Impacts resulting to sites from oil spills would include contamination of sites with oil and physical destruction of sites from cleanup operations.

Most types of historic sites located along the coast are not directly at sea level or are protected by bulkheads or other artificial barriers. Thus, they would be directly affected by an oil spill but the aesthetic value could be temporarily degraded until cleanup operations were completed. Prehistoric sites (both known and unknown) located within or adjacent to low lying areas that are tidally influenced could be permanently impacted by an oil spill that reached shore, contaminating the site with oil.

Onshore processing and storage facilities and pipeline construction could cause the physical destruction or alteration of historic and prehistoric cultural resources. However, the probability of this occurring is very remote as state environmental and regulatory agencies have opportunities to review plans for onshore development related to offshore oil and gas activity prior to construction.

Onshore cultural resources are further protected by the Advisory Council on Historic Preservation. This Council (established by the National Historic Preservation Act of 1966) has the power to comment on any federally liscensed or sanctioned activity which could impinge on sites listed or eligible for inclusion in the National Register of Historic Places. The Council would in turn seek the advice and comments of the appropriate state agency responsible for cultural preservation.

Under Alternative I-1, it is projected that 136 exploratory wells and 272 development/production wells would be drilled, and 11 platforms would be placed in the Eastern Gulf of Mexico Planning Area. It is also projected that, as a result of sales under Alternative I-1, approximately 165 to 274 acres would be disturbed by the construction of onshore support facilities. The number of oil spills, greater than 1,000 barrels resulting under this alternative for the Eastern Gulf is projected as 1.5.

Conclusion Due to the largely unlocated cultural resource base, a statement as to the potential for interaction between the impact producing factors and the resource cannot be made. It can be stated that with an increased amount of development there is an increase in the probability for an adverse interaction. Any impact is expected to be moderate.

Cumulative Impacts In the event that all tracts offshore the Eastern Gulf are leased and developed during the life of the proposal, the expected number of oil spills is 3.4 spills greater than 1,000 bbl and 1.8 spills greater than 10,000 bbl. An additional 16 oil spills greater than 1,000 bbl and four spills greater than 10,000 bbl are expected to result from import tankering of crude oil. An unknown number of oil spills could occur from development in State Tidelands. It is unlikely that multiple spills would occur in the same area. The cumulative impact of these oil spills on cultural resources is expected to cause a high level of local impacts.

About 1039 exploratory/development wells, 30 platforms, and two pipelines are estimated for this area with all Federal OCS resources developed. Currently there are no platforms on the Federal OCS and no platforms in state waters. An unknown number of structures may occur as a result of resource development in State Tidelands.

Approximately 200 to 400 acres of land could be required with all Federal OCS resources developed. An unknown amount of land could be used to support oil/gas development in state waters. Commercial and residential construction and dredging within coastal areas would also impact cultural resources. The overall cumulative impact of this construction and ancillary activities is expected to result in a very high level of impact on cultural resources in this region.

The proposal contributes less than 44 percent of oil spills greater than 10,000 bbl; less than 25 percent of the wells, platforms, and pipelines; and less than 24 percent of land use. Since the non-OCS-related impacts probably have a greater impact on cultural resources, the contribution of the proposal to cumulative impacts is high whether all resources offshore the Eastern Gulf are leased and developed or only the resources described for Alternative I-1 are developed.

2) Impacts of Special Concern

a) Impacts on Commercial Fisheries

Total fish and shellfish landings in the eastern Gulf in 1977 were valued at $76.5 million. Recent landings in the central Gulf indicate that the annual value of fisheries landed in the region is about $240 million. The value of fisheries landed in the western Gulf in 1978 was about $150 million.

The Gulf fisheries are dominated by estuarine dependent species. Some of the more important finfish and shellfish include shrimp, blue crab, oyster, Gulf menhaden, mullet, spotted seatrout, and Atlantic croaker. Many of these species leave the estuaries for greater or lesser periods of migration and spawn at sea. The eggs of many of these species hatch in open waters. The young larvae become part of an immense plankton swarm at the mercy of tides, wind, and currents, and then the young animals arrive at the estuarine nursery grounds where they feed, grow, and mature before heading out to sea to repeat the process. Other fisheries resources, such as the sessile oyster, spend their entire lives in the estuarine areas.

Oil and gas activities in the Gulf may affect commercial fishing in two primary ways: (1) effects on fishing activities and (2) effects on the resources. Fishing activities involve the harvesting and marketing of the resource. The ability to harvest the resource can be impacted by competition for shore facilities, labor and goods; at sea, space competition, such as gear conflicts and associated losses, and area closures, and removal of fishing space. The major impact agent that could affect fishery resources would be an oil spill. Oil spills have direct effects on floating eggs and larvae, result in habitat destruction, and contamination and/or interrupt food chains. Oil spills could be especially harmful to young finfish and shellfish in the nursery grounds and to sessile shellfish, such as the oyster. Contamination of oyster harvest areas could lead to closure of these areas for a significant period of time.

In the Eastern Gulf for Alternative I-1 the area foreclosed by platforms (11 platforms expected) as percent of fishing area is estimated to be less than .001 percent (about 20,000 acres). This is considered to be a very insignificant percentage of the total fishing area, and a low impact on fishing activity is expected. No ports are expected to become significantly crowded and a low impact on fishing activity is expected. The fishing area overlying the continental shelf is estimated to be from 10-20 percent. Some gear conflicts as described under Unavoidable Adverse Impacts (V.D.4.a.4).b).) will occur. However, these will be largely compensated through normal legal routes or through the Fishermen's Contingency Fund.

The expected number of oil spills in the eastern Gulf from this proposal is 1.5 and the conditional probability that a spill will contact finfish or shellfish nursery grounds or shellfish harvest areas is 0.08 percent. Although the expected number of spills is low and the probability is very low, the potential is there for a high impact on commercial fishery resources should oil contact finfish and shellfish nursery grounds or shellfish harvest areas. In that event, there would be high, localized mortality of juvenile commercial finfish and shellfish, habitat destruction, and interference with the actual harvest of these species. Repeated contact of these areas by one or more spills would result in a more severe impact on commercial fishery resources. A large oil spill would adversely affect the commercial fishing industry due to loss of income if important fishing areas would have to be closed during the principal harvest seasons. These adverse impacts would be short term but would have the potential for serious localized economic losses.

Conclusion Moderate impact is expected on fishing activities. However, there could be a high impact on commercial fishery resources and on the commercial fishing industry should an oil spill contact major finfish or shellfish nursery grounds or major shellfish harvest areas. The likelihood of such an event occurring is low, however.

Cumulative Impacts If all tracts are leased and developed during the life of the proposal, the expected number of oil spills greater than 1,000 barrels is 3.4 and the expected number of oil spills greater than 10,000 bbl is 1.8 Additionally, 16 oil spills greater than 1,000 bbl and four oil spills greater than 10,000 bbl are expected to result from import tankering of crude oil. An unknown number of oil spills are expected to occur as a result of oil and gas activities in state-owned coastal areas. Although unlikely, the possibility exists that a relatively large oil spill contacting estuarine nursery areas would be followed by another one in the same area. The cumulative effects of successive oil spills on estuarine nursery areas are expected to be moderate to high and could be relatively long-term.

Thirty platforms, 1039 exploratory/development wells, and two pipelines are estimated for this area with all Federal OCS resources developed. Currently, there are no platforms on either the Federal OCS or in State waters. An unknown number of additional structures may be built as a result of resource development in State-owned coastal areas. The total fishing area that will be lost throughout the planning area from these structures will be very small.

Vessel traffic from existing and future oil and gas activities, gear conflicts, and crowding of ports associated with total development of oil and gas resources may create moderate to high impacts on the commercial fishing industry. The commercial fishery is also stressed for other reasons, such as fluctuations in fish populations, changes in market conditions, and restrictions on finfish and shellfish harvests. These others sources may cause moderate to high economic impacts on the industry. Overall, the expected regional impacts on commercial fisheries due to cumulative impacts from Alternative I-1 are moderate.

The proposal contributes less than 44 percent of the oil spills greater than 1,000 bbl, and perhaps 20 percent of the oil and gas vessel traffic, but does not contribute significantly to the other impact agents discussed above. OCS related impact agents have a sizable impact on the commercial fishery and the contribution of the proposal to cumulative impacts to these fisheries is moderate, whether all resources offshore the Eastern Gulf are leased and developed or only resources described for the alternative are developed.

b) Impacts on Endangered Species

The major endangered marine mammals which occur in the Eastern Gulf are: sperm, sei, right, humpback, and fin whales; and the manatee. A discussion of the general impacts on whales is found at the beginning of the North Atlantic endangered species discussion. Manatees are especially susceptible to collisions with boats in shallow coastal waters because of their slow moving habits and the confining nature of the coastal harbors, rivers, and channels they normally inhabit. Oil spills could adversely affect manatees and the aquatic vegetation which they consume.

The major endangered and protected marine reptiles which occur in the region are: loggerhead, and green turtles; and the alligator and crocodile. The impacts to these species are discussed under the South Atlantic Region.

The major endangered bird species which occur in this region are: brown pelican, and bald eagle. Potential impacts to these species are the same as discussed under the South Atlantic Region.

A regional endangered species consultation was held with Fish and Wildlife Service and National Marine Fisheries Service (February 1979) pertaining to the Gulf of Mexico OCS. It is the biological opinion of these agencies, with stated conditions, that leasing and exploration activities are not likely to jeopardize the continued existence of the endangered or threatened species considered in the consultation or result in the destruction or adverse modification of their critical habitats.

In the Eastern Gulf, Alternative I-1 proposes six OCS lease sales which will offer tracts in the Eastern Gulf (two GOM and four EGOM sales). A potential 10-15 percent increase in boat traffic into Port Manatee and Port Charlotte areas as a result of this proposal may have a low level impact on manatees and loggerhead turtles in these areas. The potential production and transportation of oil resulting from this proposal could result in .16 oil spills with a nine percent probability of contacting shore within 10 days. About 20-25 percent of the approximately 868 miles of shoreline in the Eastern Gulf is potential endangered species habitat and small sections (3-15 miles) of this habitat could be adversely affected by oil spills resulting in a low level impact on loggerhead turtles and brown pelicans along the southwestern Florida coast. Onshore facilities which may be constructed as a result of this proposal would require about 165 to 274 acres of land in developed coastal areas and is not expected to significantly affect endangered species habitat.

Conclusion In the Eastern Gulf, Alternative I-1 is expected to have a very low level impact on manatees from boat traffic, and to loggerhead turtles and brown pelicans from oil spills, but no significant adverse effects on their populations or habitats are expected.

Cumulative Impacts In the event that all tracts offshore the Eastern Gulf are leased and developed during the life of the proposal, the expected number of oil spills is 3.4 spills greater than 1,000 bbl and 1.8 spills greater than 10,000 bbl and four spills greater than 10,000 bbl are expected to result from import tankering of crude oil. An unknown number of oil spills could occur from development in State Tidelands, A total of about 20 oil spills greater than 1,000 bbl.

are expected, however, it is unlikely that multiple spills would occur in the same area. The cumulative impact of these oil spills on endangered species is expected to cause a low level, short-term, local impact.

Vessel traffic from existing and future oil/gas activities may create very low impacts to endangered species. The use of ports and harbors associated with total development of oil/gas resources offshore the Eastern Gulf. (Federal and State) are not expected to be significantly different from the impacts described above for the proposal.

Endangered species are also stressed from other sources such as fluctuations in food resources and weather, pesticides, loss of habitat, and for the manatee, collisions with pleasure boats and drowning in automated flood control structures. Overall the expected regional impacts on endangered species due to cumulative impacts is low .

Alternative I-1 contributes less than 44 percent of the oil spills greater than 1,000 bbl, less than 44 percent of the oil spills greater than 10,000 bbl, and approximately 20 percent of the oil/gas vessel traffic, but does not contribute significantly to the other impact agents discussed above.

Since the non-OCS-related impact agents have a greater level of impact on endangered species, the contribution of Alternative I-1 to cumulative impacts on these species is very low whether all resources offshore the Eastern Gulf are leased and developed or only the resources described for Alternative I-1 are developed.

c) Impacts on Habitats and Resources of Special Concern

Biologically sensitive areas in the Eastern Gulf include live bottom areas similar to those described previously. The available evidence indicates that these areas are sparsely scattered throughout the shelf of the Eastern Gulf in small patches. The Florida Middle Grounds are probably the best known and most biologically developed of these areas, with extensive inhabitation by hermatypic corals and related communities, including corals, molluscs, crustaceans, sponges, crinoids, echinoderms, and algae; These high value biotic communities would be severely damaged if oil and gas operations were to take place right on them. The impacts would be due to two aspects of oil and gas operations: first, the drilling muds and cuttings will settle on and smother the benthic organisms within 100 m or so of the well site, and some constituents of the muds may be toxic to organisms within approximately 25 m of the discharge point. Second, such operations will cause destructive mechanical damage due to anchor, drilling itself, submersible and jack-up rig damage, and the installation of pipelines. While the area of such damage will be small, the areas of unique and productive biota are also small, and thus the damage to those ecosystems will be quite high, but avoidable if the biological stipulations are applied.

Conclusion Oil and gas activities on these areas will cause moderate, long-term damage to these unique and productive areas. Each well location will impact up to eight acres of benthic habitat.

Cumulative Impacts. In the event that all tracts offshore the Eastern Gulf are leased and developed during the life of the proposal, the expected number of oil spills greater than 1,000 bbl is 3.4 and the expected number of oil spills greater than 1,000 bb is 1.8. Additionally, 16 oil spills greater than 1,000 bbl and four oil spills, greater than 10,000 bbl are expected to result from import tankering of crude oil. An unknown number of oil spills are expected to occur as a result of oil and gas activities in state-owned coastal areas. About 1039 exploratory/development wells, 30 platforms, and two pipelines are estimated for this area with all Federal OCS resources developed. Currently, there are no platforms on the Federal OCS nor in State waters. An unknown number of structures may be built

as a result of resource development in state-owned coastal areas. Although unlikely, the possibility exists that a selectively large oil spill contacting estuaries would be followed by another one in the same area. The cumulative effects of successive oil spills on coastal ecosystems and nursery areas are expected to be high and could be relatively long-term.

Furthermore, oil and gas well operations, successive well blowouts, spillage of drilling muds and cuttings, and the accidental introduction of toxic chemicals into water close to hard bottom areas over the life of the proposal would cause relatively long-term and high cumulative impacts.

Vessel traffic in the estuaries will cause pollution and erosion of this habitat. Commercial fishing vessel traffic will have greater impacts on the estuaries than does oil/gas related vessel traffic.

Natural subsidence, urbanization and construction projects and the dredging and maintaining of coastal waterways contribute significantly to long-term cumulative impacts on estuaries and nursery areas.

Alternative I-1 contributes less than 44 percent of the oil spills greater than 1,000 bbl; less than 44 percent of the oil spills greater than 1,000 bbl, and probably less than 20 percent of the oil/gas vessel traffic, but does not contribute significantly to the other impact agents discussed above.

Although the non-OCS-related impact agents have a greater level of impact on habitats and resources of special concern, the contribution of Alternative I-1 to cumulative impacts on habitats and resources of special concern is moderate, whether all resources offshore the Eastern Gulf are leased and developed or only the resources described for Alternative I-1 are developed.

d) Air Quality

A discussion of the primary factors used in assessing onshore air quality impacts which may result from OCS-related activities and the method employed in quantifying the impact on this planning area are described in Section V.A.3. of this document.

Information on nonattainment areas in the Eastern Gulf of Mexico planning area is provided in Table V.D.4.a.1)d)-1.

Table V.D.4.a.1)d)-1. Nonattainment Areas Within the Region

State	Area	Nonattainment Pollutants
Florida	Pinnelas Co.	SO_2, O_3
	Hillsborough Co.	O_3
Alabama	Mobile Area	TSP

It is estimated that 136 exploratory wells will be drilled to identify the resources and 272 development/production wells and 11 platforms to develop the resources under this alternative. It was assumed, for the purposes of analysis, that production from an average platform would be 1.6 million barrels of oil and 20 billion cubic feet of gas per year. Oil produced in the region is assumed to be tankered out of the region. Estimated representative emissions for exploratory/development are provided in Table V.D.1.a.2)d)-2 This information is derived from Table V.A.3-1.

Table V.D.1.a.2)d)-2 Estimated Representative Emissions

Activity	Production at Platform (tons per year)				
	VOC	NO_x	TSP	SO_2	CO
oil/gas	3	45	–	0.1	17
barging	53	–	–	–	–

It is estimated that OCS facilities may be located within 20 miles of the coast. Some development is likely within 20 miles of the shore near northwestern and southwestern Florida. Most development (platforms) is expected to occur beyond 20 miles.

A low qualitative impact is expected from routine emissions. The area code is primarily attainment for all pollutants, except for a few scattered nonattainment areas.

If a blowout, oil spill, or fire were to occur at a platform nearshore, short-term violations of several NAAQS could occur, depending on the type and duration of the accident.

Any emission sources which would adversely affect the onshore air quality would be subjected to mitigation required by EPA and the State, if located onshore, or by DOI, if located on the OCS. ERG (1981) discusses mitigation measures for OCS facilities.

Conclusions A low level of impacts to air quality is expected to occur as a result of Alternative I-1.

Cumulative Impacts It is estimated that a total of 1.23 billion barrels of oil and 1.36 feet of gas exist in the entire Eastern Gulf of Mexico Federal OCS planning area. In the event that total development of all federal reserves occurs over the life of this proposal, 30 new platforms with 1039 wells would be required. It is very unlikely that this magnitude of development will occur over the life of this proposal.

The major influencing factors affecting the onshore air quality along the Eastern Gulf of Mexico as a result of this development are: 1) the number of new wells drilled, 2) the timing of the activities, 3) the location of the platforms and 4) the instantaneous local meteorological conditions. The offshore development of this proposal contributes moderately to regional cumulative air quality and the onshore development, contributes from moderately to very high to the regional and local cumulative air quality.

The increase in oil and gas development delineated in this proposal will occur as the entire Gulf of Mexico region grows in population as a result of unrelated industrial growth in the area. In most cases, oil and gas activities will be very small part of this overall growth. The cumulative impact of this overall growth could increase ambient pollutant concentrations. Further economic growth in communities along the Gulf could be restricted by the increasing level of pollutants approaching federal and state air quality standards.

If the oil and gas produced as a result of this proposal replaces oil and gas presently being processed in onshore facilities (but coming from decreasing yield

fields, platforms or impacts) no cumulative impact to air quality would result; production levels at onshore facilities would remain stable with only the substitution of one source of raw product for another source.

Due to the proximity of some geologically favored areas to shore a possible cumulative regional air quality impact may result if several platforms are either clustered near one another or are close to shore.

Overall, cumulative regional air quality impacts are expected to be moderate to high; local impacts will range from moderate to very high. However, EPA rules associated with the Clean Air Act and the DOI air quality rules have provisions to minimize these impacts.

e) Impacts on Recreation

The Gulf coast shoreline in northwest and southwest Florida is composed of continuous land and water highly supportive of water-oriented and water-enhanced recreational activities. National Parks, Monuments and Seashore, State Park and Recreational Areas, wildlife refuge and management areas, aquatic preserves, wilderness areas, scenic rivers, natural landmarks, sandy beaches, coastal barriers and keys are places in which people swim, snorkel, boat, fish, picnic, and participate in many other activities associated directly or indirectly with the shore.

Because 6 to 10 proposed sales affecting the Eastern Gulf between 1982 and 1986 would mostly be accomodated by already existing fabrication and refinery facilities in the coastal areas of the Central Gulf, little competition for prime recreation lands is expected to result in the coastal area bordering the Eastern Gulf regardless of the choice of alternatives. Some small land needs and water access requirements for storage and supply bases and staging areas are unlikely to conflict with recreational programs or plans.

Should one or more oil spill reach shore in an acute state, it is very likely to impact primary shorefront recreational reas of the Eastern Gulf. Such an event is likely to cause short-term pollution (up to 3 months), distrubance of the resou base and temporary loss and displacement of water related, near shore recreational activities. The degree of adverse short-term impact to recreation from a major oil

spill is dependent upon the location, size, type, and persistance of the spill, time of year, and success of containment and clean up effort.

tional areas of the Eastern Gulf. Such an event is likely to cause short-term pollution (up to 3 months), disturbance of the resource base and temporary loss and displacement of water related, near shore recreational activities. The degree of adverse short-term impact to recreation from a major oil spill is dependent upon the location, size, type, and persistance of the spill, time of year, and success of containment and clean up efforts.

The major recreational activity which commonly extends out into the Eastern Gulf where OCS leasing and operations occur is recreational fishing. Oil and gas development is known to significantly enhance deep sea recreational fishing. Major semi-permanent installations such as easy to locate, multi-well platforms placed in offshore lease tracts would attract and concentrate sport fish and inevitably sport fishermen. The literature is replete with documentation on the reefal effects of artificial structures placed in the marine environment. The existence of almost 100 permitted artificial reefs in the Eastern Gulf demonstrates the public interest in artificial fishing

expected in the Eastern Gulf due to the level of resnurces as well as the availabiltiy of such facilities in the Central and Western Gulf.

Generally, the proposed schedule of sales is expected to result in the following adverse socioeconomic impacts on such activities as tourism or transportation within the Eastern Gulf region. The conclusion is based on the most recent oil spill analysis for the entire Gulf region. It indicated that the number of oil spills which can be expected to reach Florida tourist beaches along the Gulf of Mexico within 3, 10, r 30 days as a result of an oil spill related to the proposed schedule will probably be around 0.5 spills of 1,000 barrels or more.

Second, U.S. Army Corps of Engineers data for 1979 indicate that over 55,000 vessel trips were recorded to and from major port areas in the Eastern Gulf. Major ports were defined as having controlled depths of more than 12 feet. While the amount of OCS related marine traffic due to the proposed schedule may result in a significant increase in the number of vessel trips in this region, the current framework for minimizing any waterway user conflicts, i.e. federal, state, and local jurisdictional authorities, will be satisfactory. This conclusion is further based on actual experiences in the Central Gulf region, where over 468,000 vessel trips were recorded at major ports in 1979.

Conclusion New resident population and employment growth in the Eastern Gulf due to the proposed schedule is not expected to create major infrastructure stresses. The negative impacts on tourism along the Florida Gulf coast as a result of a major oil spill associated with the proposed schedule will be low to moderate. Also, adverse impacts on port activity will be negligible. The overall level of impact is expected to be very low.

Cumulative Impacts If all tracts offshore the Eastern Gulf are leased and developed during the life of the proposal, the expected number of oil spills is 3.4 spills greater than 1,000 bbl and 1.8 spills greater than 10,000. An additional 16 oil spills greater than 1,000 bbl and four spills greater than 10,000 bbl are expected to result from tankering of imported crude oil. An unknown number of oil spills could occur from development in State Tidelands. It is unlikely that multiple spills would occur in the same area. The cumulative impact of these spills on socioeconomic factors is expected to cause a low level of local impacts.

Approximately 200 to 400 acres of land will be required with all Federal OCS resources developed. An unknown amount of land could be used to support oil/gas development in State waters. Commercial and residential construction within coastal areas also could impact socioeconomic factors. The overall cumulative impact of this construction and ancillary activities is expected to result in a low level of impacts on socioeconomic factors.

3) Impacts on Management Plans

a) Marine Sanctuaries

There are no national marine sanctuaries in the Eastern Gulf of Mexico at the present time.

b) Fisheries Management Plans

The fisheries management plans in effect in the Gulf of Mexico are for the stone crab and shrimp (all commercial species). Currently, fisheries management plans are being developed for coral (with South Atlantic Council), reeffish, groundfish, shark, spiny lobster, and coastal herrings. No significant conflicts are expected between the management plans and the leasing schedule.

c) Coastal Zone Management

Seven of the nine largest metropolitan areas in the United States exist within the coastal zone, and more than 50% of the population lives within 50 miles of the coastline. This has caused a diversity of increasing multiple use pressures, such as

recreation, plant sitings, community development and services, and expansion of port and marine facilities, among others. Because of the interface between coastal resources and land use conflicts, the Coastal Zone Management Act of 1972 (16 U.S.C. 1451-1464) was created as a combined federal/state land management partnership. The Act, administered by the Department of Commerce, National Oceanic and Atmospheric Administration, set major goals for the protection of natural, historic, and cultural resources, provided for increased recreational access, management of coastal development, and coordination and streamlining of federal and state decisions affecting the coastal resources.

The CZMA has evolved as one of the major tools which states can use to coordinate the many federal regulatory measures, such as executive orders, programs, and acts which were enacted during the 1970's. These include the National Flood Insurance Program, Deepwater Port Act of 1974, Fishery Conservation and Management Act of 1976, and the OCSLA Amendments of 1978.

Section 305 authorized the Secretary of Commerce to issue grants to asist any coastal state in the development of a management program for land and water resources in this coastal zone with the objective of each state determining its own management plan particular to its own needs. This development has sometimes been difficult for the respective states because of the uniqueness of their coastal areas and the multiplicity of uses. Among other things, the management program must provide for adequate consideration of the national interests involved in the siting of facilities necessary to meet requirements which are other than local in nature. On final approval of the program, the state then becomes eligible for grants under Section 306 of the Act which authorizes grants of not more than 66-2/3% of the program's administrative costs. Section 307 of the Act deals with interagency coordination and cooperation. Local governments must consider state and regional interests in the exercise of the regulatory powers in the coastal zone, and federal actions within or directly impacting the coastal zone must be consistent with a state's program once that program has been approved by the Secretary of Commerce. However, should the state determine that a project is inconsistent with its program, it may request mediation efforts by the Secretary. If it is determined that the proposed federal action is consistent with the purpose of CZMA, or necessary in the interest of national security, the state's objection may be overruled. A final rule amending existing regulations was published in 44 CFR 37142, June 25, 1979, and concerns consistency for DOI outer continental shelf pre-lease sale activities and other federal activities directly affecting the coastal zone.

4) Unavoidable Adverse Impacts

a) Marine Habitats and Resources

In the Eastern Gulf of Mexico minor decreases in primary productivity due to the mortality or functional impairment of plankton, benthic organisms, seagrasses, and algae will occur in localized areas of high turbidities generated by drilling fluids disposal and bottom sediments suspended by pipeline laying and burying operations. The possibility exists that toxic materials used in mud mixtures may adversely affect some marine organisms in localized areas when the drilling fluids and cuttings are discharged; such effects will be short-lived.

Disruption will occur if fresh oil spills reach shallow sensitive biological features. Localized mortalities selective, and functional impairment would probably occur, thereby altering the community structure for an unknown, but brief, period of time.

Adverse impacts could occur to endangered and threatened species of marine mammals and birds. The most serious potential impacts would occur from major oil spills and chronic oil pollution. In leasing areas which have previously had endangered species consultations, concern for impacts to the manatee in the Gulf of Mexico has been identified, and potential lessees are put on notice regarding safeguarding this endangered mammal.

b) Commercial Fisheries

Of the various types of fishing gear in use in the OCS areas, towed bottom gear such as trawls and dredges, as well as pots, have the greatest chance for operational conflicts with oil and gas activities. These conflicts are unavoidable in all OCS areas, as these fishing methods are common to all areas. However, losses can be compensated. Trawling operations suffer interference and inconvenience from oil and gas operations in several ways. Trawl nets can become snagged on underwater stubs causing damage or loss of the nets. Pots can also be lost in this manner. In addition, it is conceivable that snags could damage underwater production equipment or pipelines causing a spill of oil and gas. Because safety equipment is installed which shuts in production when a loss of pressure occurs, the likelihood of a major spill resulting thereby is considered very small. Less frequently, large objects which were lost overboard from petroleum industry boats, pipeline lay barges, and platforms are caught by fishing gear resulting in damage to the gear and/or its catch of fish; however, occurrence of this type of incident is low.

Commercial fishermen would probably not harvest fish in the area of an oil spill, as spilled oil could coat or contaminate commercial fish species rendering them unmarketable. This would be another adverse effect to commercial fishing.

Other unavoidable adverse impacts include loss of fishing space caused by installation of unburied pipelines, rigs, platforms, or by other OCS-related structures. There may be some localized severe competition for shore facilities.

Title IV of the OCS Lands Act of 1978, as amended, provides for the establishment of a Fishermen's Contingency Fund to compensate fishermen for losses sustained on the OCS because of oil and gas activities if the losses cannot be attributed to a financially responsible party.

c) Coastal Habitats and Resources

For the Eastern Gulf planning area, the highest probability of an oil spill contacting land within 10 days, if one were to occur is 9%; and the highest expected number of oil spills occurring over the expected production life of the lease is 1.5 If an oil spill does contact coastal wetlands, adverse environmental impacts will be high. The entire coastline of this planning area, some 863 miles, can be affected by oil spills. Approximately 553 miles, or 64% of this coastline consist of coastal wetlands and are therefore susceptible to high adverse environmental impacts if oil contacts this habitat.

Beaches, barrier islands, wetlands and other coastal ecosystems are located throughout the areas encompassed by the proposed sales. If any of these coastal areas are contaminated by oil, an undetermined amount of fish and wildlife habitat (primarily birds) will be damaged. It is possible that a large number of deaths, particularly to birds, fish larvae and shellfish, would occur should a large spill reach shore. The adverse effects of oil on estuarine habitats may be relatively long-term.

The unavoidable short-term impacts associated with trenching and backfilling for pipeline construction include the uprooting of all plants and non-motile animals in the path of the pipeline, thereby leaving temporarily a barren strip 9 to 12 meters wide. Some unavoidable damage may also be rendered to vegetation in adjacent areas by machinery used in the operation. The long-term impacts could include saltwater intrusion, changes in floral and faunal components and a possible increase in marsh erosion if a canal is not backfilled.

In the event of an onshore oil pipeline leak or spillage at onshore facilities, it is inevitable that the vegetation would be affected to an extent that would be dependent upon the severity of the spill. While a small leak may do little damage, a severe leak may contaminate the substrate and kill the vegetation that comes into direct contact with the oil and several years may be required for recovery. Small animals in contact with the oil would probably be killed.

d) Socioeconomic Systems

The migration of labor, capital, and materials to primary impacted areas in the Eastern Gulf during the early years of oil and gas operations, and the subsequent out-migration of some of these people and resources during the later years cannot be avoided should the sales take place and if commercially recoverable amounts of oil and gas are found.

When a given area is unable to absorb needed infrastructure expenditure, and economic activity cannot be shifted elsewhere, shortages of supply and dislocations in local economies may result. Problems with allocating the production of goods and services may occur, and consumers within the locality may be affected adversely. Consumption patterns and production patterns would eventually shift so as to remove excess demand, but this adjustment is not immediate and dislocations may be experienced as the local economy works its way to equilibrium. Areas with low population densities and limited industrial bases would be the most likely to experience such adverse impacts.

A condition of uncertainty will also create unavoidable adverse impacts. To the degree that decisions are based on predictions or estimates that prove to be in error over time, adverse impacts will occur to commercial ventures that do not cover their costs. It is not likely that uncertainty could be completely removed from the decisionmaking process. Uncertainty with regard to the level of recoverable resources in the leasing areas, the actions of others, and the economic climate is bound to remain. Private industry and government, while basing their decisions on as much information as possible, will be unable to avoid the adverse impacts caused by uncertainty. Inefficient use of resources could also result from a lack of coordination between the private and public sectors and the improper sequencing of decisions on all levels.

e) Recreation

The adverse impacts on recreation that could be encountered if the proposed sales proceed are:

the competition for land between recreation and OCS-related onshore facilities, the degradation of the aesthetic environment conducive to recreation, and the damage to recreational sites caused by an oil spill. The first two impacts could largely be mitigated through careful site selection and by timing the construction of OCS facilities for the nonpeak season. When an oil spill occurs, the extent of the recreation impact is dependent upon the location and size of the spill, the time of year in which the spill occurs, and the degree of success of cleanup.

A major spill would largely preclude any recreational activity in the affected area. Should oil impact a beach, the recreational use of that beach will be eliminated or dislocated until cleanup procedures have been completed and the beach restored to a desirable, usable state. The use which the impacted beach would normally receive could be temporarily transferred to surrounding beaches (if available), which might cause crowding and ultimate denial of beach areas to some people. Oil spills could temporarily close marinas and boat launching facilities. This would deny some boaters the opportunity to participate in the activity. The spill could result in bird mortality which could affect hunting activities.

f) Air Quality

Offshore operations generate a small but significant amount of air pollutants resulting from stationary combustion or from venting produced gas. In most cases, the emissions will be quickly dissipated by climate conditions, and there would not be an increase in air quality degradation onshore.

structures in the marine environment. The degree to which offshore oil and gas development will affect recreational fishing is believed to be related to such factors as the number and size of structures erected, the length of time they are in place, and the distance they are from shore. Water depth, oceanic conditions, and bottom type around an offshore platform will also affect the recreational fishing associated with oil and gas structures offshore.

Conclusion Alternative I-1 is likely to have very low to moderate level of impact on recreational resources or activities as a whole in the Eastern Gulf; however, one or two major oil spills are likely to cause significant short term disruption of a few discrete shorefront recreational resources and temporarily displace associated recreational activities. Offshore recreational fishing is likely to increase in the accessible leasing areas where platforms are constructed.

Cumulative Impact In the unlikely event that all tracts offshore the Eastern Gulf are leased and developed during the life of the proposal, the expected number of oil spills is 3.4 spills greater than 1,000 bbl and four spills greater than 10,000 bbl. An additional 16 oil spills greater than 1,000 bbl and 1.8 spills greater than 10,000 bbl are expected to result from tankering of imported crude oil. An unknown number of oil spills could occur from development in State Tidelands. It is unlikely that multiple spills would occur in the same area. The cumulative impact of these spills on recreation is expected to cause a moderate level of local impacts.

About 30 platforms and two pipelines are estimated for this area with all Federal OCS resources developed. Currently there are no platforms on the Federal OCS and no platforms in state waters. An unknown number of structures may occur as a result of resource development in State Tidelands.

Approximately 200 to 400 acres of land will be required with all Federal OCS resources developed. An unknown amount of land could be used to support oil/gas development in State waters. Commercial and residential construction and dredging within coastal areas also could impact recreation. The overall cumulative impact of this construction and ancillary activities is expected to result in a moderate level of impacts on recreation in this region.

The proposal contributes less than 44 percent of oil spills greater than 1,000 bbl; less than 44 percent of oil spills greater than 10,000 bbl; less than 33 percent of the platforms and less than 24 percent of land use. Since the non-OCS-related impacts probably have a greater impact on recreation, the contribution of the proposal to cumulative impacts is low to moderate whether all resources offshore the Eastern Gulf are leased and developed or only the resources described for Alternative I-1 are developed.

f) Impacts on Socioeconomic Factors

The conditional mean estimates of resources recoverable from the Eastern Gulf region as a result of the proposed leasing schedule are .55 billion barrels (bbls) of oil and .71 tcf of natural gas. Based upon the most recent analysis prepared for this area, Sale 67/69 FEIS, peak total employment due to the proposed schedule is expected to be about 6,800 people. About 75 percent of these employees will be locally hired, which will help reduce areawide unemployment. The remaining 25 percent, or about 1,700 people, will represent new resident employment. New resident population in the Eastern Gulf region will be about 3,900 in the peak year as new residents move into the area in response to these additional employment opportunities.

Exploration activity in the Eastern Gulf is expected to require up to 3 temporary service bases, and at least one permanent base. While Port Manatee seems most likely as the site for most service establishments, other possible locations include Pensacola and Panama City, which would primarily serve northwest Florida OCS activity, No platform fabrication yards or refineries are

If a natural gas leak or blowout were to occur, air quality degradation would be minimal. Oil leaks and oil spills which would not be accompanied by a fire would introduce highly volatile, low molecular weight hydrocarbons such as benzene and toluene into the atmosphere. These lighter fractions of crude oil would undergo some unknown degree of degradation, possibly resulting in photochemical smog. If a spill were to result, smaller but unknown amounts of sulfur oxides, evaporated crude oil liquids, and partially oxidized compounds would enter the air. Local air quality would be severely degraded for the duration of the fire. The extent of degradation cannot be determined but it is unlikely that it would be high enough to affect land resources or human health.

Air quality is not a major concern for the Eastern Gulf of Mexico leasing areas. Due to the existing onshore air quality, and natural mitigation measures, additions from OCS-related development activities would probably not need to be offset or otherwise mitigated.

Air quality will also be unavoidably degraded in the vicinity of onshore transshipment and processing facilities. Through air quality standards and permitting, locations of emissions from these facilities would be tightly regulated. Therefore, adverse impacts are expected to be minor.

g) Navigation and Shipping

A certain amount of interference between offshore structures and vessel traffic will occur as a result of the proposed sales. This could lead to an increase in accidents involving OCS vessels and structures. However, because shipping will use the existing network of fairways, the probability of an accident per trip is low.

Very little navigational interference can be expected between ships utilizing established fairways. Coast Guard regulations regarding structure safety lights and horns, and ship safety regulations are important factors, also, in minimizing conflicts and preventing accidents between structures and vessels on the OCS. However, at night, in rough water, and in fog the potential for all accidents increases.

h) Water Quality and Supply

Normal offshore operations would have unavoidable effects to varying degrees on the quality of the surrounding water if the proposed sales are implemented. Drilling, construction and pipelaying would cause an increase in the turbidity of the affected waters for the duration of the activity periods, and, in the case of pipelines, could disturb settled pollutants. A turbidity plume, several hundred yards in length, could also be created by the discharge of drill cuttings and the adherent drilling fluids. This, however, would only affect waters in the immediate vicinity of the rigs. The discharge of treated sewage from the rigs and platforms would increase the levels of suspended solids, nutrients, chlorine, and BOD in a small area near the discharge points. Chronic spills from platforms and the discharge of formation waters will result in increases of the hydrocarbon levels and possibly trace metal concentrations in the water column. Overall, the effect will be the degradation of water quality around platforms, although the extent of the impact will extend only from a few meters to a few tens of meters from the platform site.

Unavoidable impacts to onshore water quality will also occur as a result of runoff from construction sites of new facilities, but these impacts will be localized in the vicinity of these sites, and of limited duration. Some additional impacts will accrue from increased sewage due to population growth in certain communities. All of these onshore impacts will be mitigated by regulation by state water quality boards acting under existing federal and state regulations and guidelines.

Only in the Eastern Gulf of Mexico (Florida), where water supply is limited and presently recognized to be a regional problem does there exist a potential for significant impact due to increased demand as a result of the proposed action.

i) Cultural Resources

Assuming invocation of the archaeological survey requirement on all leases within the area of high probability for the occurrence of prehistoric sites, impacts to the largely unknown resource base would be avoided or mitigated as far as is currently technologically feasible. Assuming invocation of the archaeological survey requirement on all leases within the area of high probability for the occurrence of shpwrecks, impacts to the largely unlocated resource base would be avoided or mitigated as far as is currently technologically feasible. An exception to this would be the possibility of completely missing the remains of the more than 500 pre- 19th century ships known to have gone down in the Gulf of Mexico (CEI, 1977), due to the sampling nature of the magnetometer survey and the relatively small amount of ferromagnetic remains which would be associated with such ships. This would be a significant impact.

Coastal prehistoric sites would possibly be contaminated should an oil spill occur.

Physical alteration or destruction of sites may also occur as a result of cleanup operations. There is a low risk for such oil spill related impacts to occur under this alternative since 1.5 spills of greater than 1000 barrels are projected for the Eastern Gulf.

Coastal National Register sites such as forts and lighthouses, as well as numerous coastal historic sites not on the National Register, would possibly be contaminated should an oil spill occur. Physical alteration or destruction of historic sites may also occur, but is highly unlikely, as a result of clean-up operations. Oil contamination would only be a temporary impact to most historic sites.

5) Relationship Between Short-Term Uses of Man's Environment and the Maintenance and Enhancement of Long-Term Productivity

The principal short-term use of the leased areas in the Eastern Gulf under the proposed schedule would be for the production of .55 bbbls of oil and .71 tcf of natural gas. This activity would temporarily interfere with tourism in the region in the event of a major oil spill (1,000 barrels or more) contacting popular tourist beaches. The expected number of such spills within a 30-day period after an oil mishap is 0.5. The expected economic impact based on such occurrence estimate is low to moderate.

The proposed leasing may also result in onshore development and population increases which may cause very short-term adverse impacts to local community infrastructure, particularly in areas of low population and minimal existing industrial infrastructure. However, these impacts will occur only in the very short run. A return to equilibrium can be quickly expected as population changes and industrial development are absorbed in expanded communities.

After the completion of oil and gas production, oil spills and their impacts will not occur, and the marine environment is generally expected to remain at or return to its normal long-term productivity levels. It has been recognized that continuous, low-level pollution from toxic chemicals, including oil, may adversely affect long-term productivity. However, to date there has been no discernable decrease in long-term marine productivity in OCS areas where oil and gas have been produced for many years. Areas such as the Atlantic coast, which experienced repeated incidents of oil pollution as a result of tanker groundings during World War II, show no apparent long-term productivity losses, although baseline data do not exist to verify this. In other areas which have

experienced apparent increases in oil pollution, such as the North Sea, some long-term effects appear to have taken place. Populations of pelagic birds have decreased markedly in the North Sea in recent years—prior to the beginning of North Sea oil production. Until more reliable data becomes available, the long-term effects of the chronic and major spillage of hydrocarbons and other drilling related discharges cannot be accurately projected. In the absence of such data, it must be concluded that the possibility of decreased long-term productivity exists as a result of the proposed action.

In summary, short-term environmental and socioeconomic impacts would result from the proposed leasing schedule, including possible short-term losses in productivity as a result of oil spills. Oil and gas reserves would be lowered. Few long-term productivity or environmental gains are expected as a result of the proposed schedule; the benefits of the leasing schedule are expected to be principally those associated with a medium-term increase in supplies of domestic oil and gas. While no reliable data exist to indicate long-term productivity losses as a result of OCS development, such losses are possible. However, to the extent that OCS development would replace imports of oil which would otherwise be required, such losses as a result of tanker-related oil spills may occur in the absence of the proposals.

6) Irreversible and Irretrievable Commitment of Resources

a) Mineral Resources

The proposed sales are estimated to result in the production of .55 billion barrels of oil and .71 trillion cubic feet of gas. This constitutes an irreversible commitment of these resources. Their development and production for energy and other uses in the short and mid-term will foreclose their availability in the future. Long-term alternate sources for energy are currently being developed, which would provide for sources of energy in the future. Other significant uses of hydrocarbons include manufacture of plastics, synthetic fibers and other synthetic materials, fertilizers, and drugs. Use for manufacture of petroleum products in the future would also be foreclosed by production of these hydrocarbon resources in the 1980's and 1990's.

b) Biotic Resources

An irreversible and irretrievable commitment of biotic resources would occur in area subjected to intensive development. Oil spills and chronic low level pollution can injure and kill organisms at virtually all trophic levels. Mortality of individual organisms can be expected to occur, and possibly reduction or even elimination of a few small or isolated populations. The magnitude of these effects is nearly impossible to predict; Section IV.A. identifies the types of impacts which can occur and the resources which are particularly sensitive to adverse impacts resulting from the proposal. Between 165 and 272 acres of habitat could be developed or affected by development of OCS-related facilities in the Eastern Gulf. More specific analysis of the flora and fauna which may be impacted, their population levels and dynamics, and potential adverse impacts will be possible in site-specific analyses in sale-related environmental statements.

c) Human Resources

Human casualties can be expected to occur as the result of OCS industry activities. Between 1970 and 1976, there were 102 deaths and 162 injuries directly related to OCS-related drilling activities. Accidents on rigs and platforms, including blowouts, helicopter crashes, and boat accidents, can be expected to occur and result in an irretrievable commitment of human resources, despite mitigating measures to improve the safety of OCS operations.

d) Land Resources

An irretrievable commitment of land resources will result from the proposal but the use of sites where development exists can reduce or eliminate this commitment of resources. In the Eastern Gulf, the area is still considered a frontier area with

THE MORE SIGNIFICANT ENVIRONMENTAL CONSEQUENCES

Eastern Gulf of Mexico Resource Category	Level of Expected Impacts [1/] Scheduled Sales Only Under Alternative I-1	Cumulative Impacts of All Activities
1. General Impacts		
a. Coastal Ecosystems	moderate	high
b. Water Quality and Supply		
Water Quality	low to moderate	low
Water Supply	low to moderate	moderate
c. Navigation and Shipping	very low	very low
d. Other Uses of the OCS	high	high
e. Land Use	very low	moderate
f. Cultural Resources	moderate	high
2. Impacts of Special Concern		
a. Commercial Fisheries	moderate	moderate
b. Endangered Species	very low	low
c. Habitats and Resources of Special Concern	moderate	moderate
d. Air Quality	low	moderate to high
e. Recreation	low to moderate	moderate
f. Socioeconomic Factors	very low	low

1/ Definitions of levels of impact are located at the beginning of Section V. D.

(This table also applies to alternatives I-2, II, III-1, III-2, and IV. See text.)

little existing infrastructure. The state of Florida has indicated that facility sitings should occur in areas with existing industrial infrastructure; therefore, it is difficult to estimate how much actual land will be utilized for either expansion or new sitings. It should be noted that until such time as it is economically feasible to do so, facilities will not be constructed, particularly when the central and western Gulf can provide the necessary services.

e) Economic Resources

Decisions to proceed with sales on the proposed schedule will result in production of goods and services, including investment in required facilities. To the extent that these resources are drawn away from other uses, production of goods and services in alternate locations or of other types may be foregone. Steel products, specialized manpower and capital constitute required resources which may be scarcest.

f) Cultural Resources

Any damage to archaeological or historical sites either known or undiscovered, would result in an irretrievable commitment of nonrenewable resources. Their usefulness as a source of archaeological data would be lost or greatly diminished as a result of oil spills or construction damage.

b. Alternative I-2: The Proposed Schedule with Offerings of Favorable Geological Acreage

This option would retain the streamlining proposal but offer only the favorable geological acreage. The environmental impacts that would result from this proposal will be essentially the same as those described under Alternative I-1 since the bulk of the analysis for Alternative I-1 was based on the assumption that only development of areas with high resource potential would occur. However, under Alternative I-1 some development may occur outside the high resource potential areas. The impacts that would result from this development would not occur under Alternative I-2.

By limiting areal extent of possible leasing, subsequent environmental studies and analyses could concentrate on areas encompassing the favorable geological acreage. However, as occurs under the present schedule, some studies and analyses would extend beyond the high potential areas in order to examine all impacts that may result from the schedule.

Restricting leasing would also have the advantage of reducing the area state and local governments have to consider when they plan for OCS activities.

c. Alternative II: The April 1981 Draft Schedule

Under Alternative II, in the Eastern Gulf, the expected level of impacts to resources will be the same as described under Alternative I-1.

d. Alternative III-1: The Current Schedule, the Current System - No Action

The level of expected impacts following the implementation of Alternative III-1 in the Eastern Gulf does not signficantly differ from those discussed in Alternative I-1.

The estimated hydrocarbon resources for Alternative III-1 in the Eastern Gulf are as follows: .04 billion barrels of oil and .06 trillion cubic feet of gas. Infrastructure expected to be used to explore and develop these resources include 294 wells and 8 platforms. The predicted oil resources for Alternaive III-1 are approximately .51 billion barrels

less than those predicted for Alternative I-1. Gas resources for alternative III-1 are .65 less than Alternative I-1. It is expected that .1 oil spills greater than 1,000 bbl and .1 oil spills greater than 10,000 bbl (production plus transportation) will occur following the implementation of Alternative III-1.

Expected oil spills are about 93 percent (1.4 spills) less than that described for Alternative I-1, Significant differences in impacts cannot be differentiated from those impacted described in Alternative I-1.

e. Alternative III-2: The Current Schedule with Larger Offerings

The estimated hydrocarbon resources for Alternative III-2 in the Eastern Gulf are as follows: .04 billion barrels of oil and .08 trillion cubic feet of gas. Infrastructure expected to be used to explore and develop these resources include 112 exploratory wells and 10 platforms. The predicted oil resources for this alternative is .51 billion barrels less than those predicted for Alternative I-1. It is expected that .1 oil spills greater than 1,000 bbl and .1 oil spill greater than 10,000 bbl (production plus transportation) will occur following the implementation of Alternative III-2.

Expected oil spills are about 1.4 less than for Alternative I-1. The predicted resources, infrastructure, and oil spills for Alternative III-2 are about 18 percent higher (exploratory well will be 16 percent higher) than those predicted for Alternative III-1. Although the resources, infrastructure, and oil spills are higher in Alternative III-2, significant differences in impacts cannot be differentiated from those described in Alternative I-1.

The drilling of fourteen additional exploratory wells and the placement of two more platforms over what is expected in Alternative III-1 would cause and increase in impact levels above that predicted from that alternative, but the difference would not be significant enough to allow the predition of levels of impact different than expected in Alternative III-1.

f. Alternative IV-1.a: Delete 7 Alaska Sales, Change the Timing of Others Using Planning Area Wide Offerings

The impacts for this alternative in the Eastern Gulf are identical to those described for Alternative I-1.

g. Alternative IV-1.b: Delete 7 Alaska Sales, Change the Timing of Others Offering Favorable Geological Acreage

The impacts from this alternative in the Eastern Gulf are identical to those described for Alternative I-1.

h. Alternative IV-2.a: Delete All Arctic Planning Areas From the Schedule While Using Planning Area Wide Offerings

The impacts from this alternative in the Eastern Gulf are identical to those described for Alternative I-1.

i. Alternative IV-2.b: Delete All Arctic Planning Area From the Schedule While Offering Favorable Geological Acreage

The impacts from this alternative in the Eastern Gulf are identical to those described for Alternative I-1.

5. Central Gulf of Mexico Planning Area

a. Alternative I-1 The Proposed Schedule with Planning Area Wide Offerings

The description of the proposal, Alternative I-1, is provided in Chapter III of this document. The data on estimated oil and gas resources, the statistically expected number of oil spills associated with the development are discussed in the subsections below as appropriate for the individual resource categories.

1) General Impacts

a) Impacts on Coastal Ecosystems

Coastal ecosystems potentially affected by the proposed lease sales, regardless of the leasing schedule adopted, include saltmarsh, brackish marsh, fresh marsh, bays, lagoons, and estuaries. About 869 miles of coastline contain some 838 miles (96 percent) of coastal wetlands. The following counties/parishes bordering the Central Gulf contain coastal wetlands: Mobile, Jackson, Harrison, and Hancock counties; Tangipahoa, St. Tammany, St. John the Baptist, St. Charles, St. Bernard, Orleans, Livingston, Plaquemines, Jefferson, Lafourche, Terrebonne, St. Mary, Iberia, Vermilion, and Cameron parishes. These wetlands perform such important biological functions as storm buffers for inland areas, detritus production, and nursery and feeding areas for many aquatic organisms, including valuable commercial and sport fish species.

Causes of impacts stem from construction of pipelines and onshore facilities, or crude oil spills from exploration, production, transportation or storage.

The effects of crude oil spills on coastal ecosystems have received considerable attention. Important variables include the amount and toxicity of the crude, the degree of weathering the crude has undergone prior to contacting a coastal ecosystem, the ecosystem type or types contaminated by the crude (i.e., marsh, beach, estuary, mangrove, etc.), the climate and weather of the spill site, the water depth and suspended sediment load, the cleanup method attempted, and previous exposure to oil spills. The above variables will determine the degree of damage and the recovery time for a particular coastal spill.

Oil reaching estuaries or marshes may have its most serious biological effects there. Because estuaries tend to act as nutrient traps, estuarine organisms can be exposed to long periods of contamination. Since many of these organisms are living at or near the limit of their tolerance range, mortality could be high. *Spartina* spp. of the East and Gulf Coast salt marshes have been shown to withstand moderate single doses of hydrocarbons, but continuous applications prove lethal because the oil kills the roots and rhizomes. All marsh plants species would probably be most affected by a spill during growing season, when the oil could influence flowering, vegetative reproduction, and seed development. In all coastal environments, oil spilled from onshore transportation or treatment activities may contaminate soil, vegetation, or shoreline. These spills may enter storm sewers and finally reach marine waters, where their deleterious effects have been previously described.

Trenching and burying pipeline nearshore and onshore up to the supratidal zone would disturb the seabottom and resuspend sediments. In marshes and estuaries, trenching or dredging may alter circulation patterns, tidal flow, and salinity gradients. Erosion of pipeline canals in marshes can cause significant losses of this habitat type.

There are approximately 2.5 million acres of coastal wetlands in the Central Gulf. Man-induced and naturally occurring wetlands losses amount to about 25,000 acres annually.

The levels of impacts of coastal ecosystems depend on the magnitude of an individual oil spill and on the frequency of spills contacting these habitats. If a spill does contact coastal wetlands, losses of marsh vegetation, mangroves, and other biologically productive habitats will be high and may be relatively long-term. For the Central Gulf the highest probability of an oil spill contacting land within 10 days, if a spill were to occur, is 31 percent; and the highest expected number of oil spills occurring over the expected from the proposal is 1.1.

In the Central Gulf there will be 2 oil/gas pipeline landfalls. These landfalls will most probably occur in one or more of the following parishes/counties: Cameron, Vermilion, Iberia, St. Mary, Terrebonne, Lafourche, Jefferson, Plaquemines, or St. Bernard parishes; and Jackson or Mobile counties. There are existing pipeline landfalls in these parishes/counties. Current regulations and authorities will ensure that the existing pipeline corridors will be used for future expansion.

Conclusion Severe and possibly long-term adverse impacts on coastal wetlands and estuaries will result if oil spills contact wetlands or if pipeline construction occurs in estuaries and marshes. The likelihood of such events is low.

Cumulative Impacts If all tracts offshore the Central Gulf are leased and developed during the life of the proposal, the expected number of oil spills greater than 1,000 bbl is 8.5 and the expected number of oil spills greater than 10,000 bbl is 1.5. Additionally, 16 oil spills greater than 1,000 bbl and five oil spills greater than 10,000 bbl are expected to result from import tankering of crude oil. An unknown number of oil spills are expected to occur as a result of oil and gas activities in State-owned coastal areas. Although unlikely, the possibility exists that a relatively large oil spill contacting wetlands would be followed by another one in the same area. The cumulative effects of successive oil spills on coastal ecosystems are expected to be high and could be relatively long-term.

Vessel traffic will cause erosion of coastal waterways and will contribute to irreversible loss of coastal wetlands. Commercial fishing vessel traffic will have greater impact concerning marsh loss than does oil/gas related vessel traffic.

Natural subsidence, urbanization and construction projects, and the dredging and maintaining of coastal waterways contribute significantly to long-term cumulative impacts on coastal ecosystem.

Alternative I-1 contributes less than 13 percent of the oil spills greater than 1,000 bbl; less than 21 percent of the oil spills greater than 10,000 bbl; less than 7 percent of the wells and 13 percent of the platforms; and probably less than 25 percent of the oil/gas vessel traffic, but does not contribute significantly to the other impact agents discussed above.

Although the non-OCS-related impact agents have a greater level of impact on coastal ecosystems, the contribution of Alternative I-1 to cumulative impacts on coastal ecosystems is moderate, whether all resources offshore the Central Gulf are leased and developed or only the resources described for Alternative I-1 are developed.

b) Impacts on Water Quality and Supply.

(1) Onshore Water Quality and Supply

General discussion of impact producing activities which might affect onshore water quality and supply is presented under the appropriate section above for the Eastern Gulf.

It is presently estimate that as many as two new gas processing plants might be constructed in the Central Gulf as a result of this proposed sale alternative. Projected population growth associated with the proposed action is not expected to significantly impact regional population is anticipated as a result of this proposed sale alternative. State and federal water pollution control regulations will mitigate most potential adverse impacts. Some local site specific degrading of water quality may be expected near new plant sites on previously unpolluted waters. Water supply requirements will be increased by only a small amount as a result of population increases; however, localized impacts to water supply may occur as a result of onshore facility siting. The extent of impacts to both wter quality and supply will depend to some extent on sjpecific facility locations.

Conclusion Onshore water pollution impacts are estimated to be low to moderate and localized as a result of the proposal.

Cumulative Impacts

An unknown amount of growth in water requirements would result from are increase in employment. Both industrial and domestic water supply would have to be increased due to population increase. Offshore operations would require about 1 million gallons of freash (non-potable) water for each well drilled.

OCS oil and gas related population increases and the attendant increase in water demands and water pollution are but a small percentage of the normal population increase and industrial growth of the area.

Since the non-OCS related impact agents have a greater level of impact on the onshore water quality and supply, the contribution of Alternative I-1 to cumulative impacts on these parameter are expected to be low to moderate, whether all resources offshore the Central Gulf are leased and developed or only the resources described for Alternation I-1 are developed.

(2) Offshore Water Quality

General discussion of impact producing activities which might affect offshore water quality is presented under the appropriate section above for the Eastern Gulf. For the Central Gulf, 1,336 wells would discharge a total of 120,200 barrels of drilling muds and 22,700 yds³ of drill cuttings each day during drilling operations. During the production phase, these 1,336 wells would discharge from 1,336,000 to 1,870,000 barrels of formation water each day. The 77 platforms would discharge about 14,700 gallons of deck drainage and heating and cooling water and 77,000 to 425,000 gallons of sanitary and domestic water each day.

Pipeline placement in a trench two to five yards wide and two yards below the seafloor would involve the disturbance of about 2,300 to 6,000 yds³ of sediments per mile. In the Central Gulf, 150 to 250 miles of pipelines may be installed. This would disturb from 345,000 to 1,500,000 yds³ of sediments. The plume of suspended sediments moves down-current; the distance varying with current speed, suspended particle load, and with water turbulence.

Conclusion The effect of sales included in the proposal will be moderate to high degradation of water quality within a few meters or tens of meters of the discharge site at each platform or rig. However, regional offshore water quality is not expected to be measurably degraded and impacts will be very low.

Cumulative Impacts If all tracts offshore the Central Gulf are leased and developed during the life of the proposal, the expected number of oil spills greater than 1,000 bbl is 8.5 and expected number of oil spills greater than 10,000 bbl is 1.5. Additionally, 16 oil spills greater than 1,000 bbl and five oil spills greater than 10,000 bbl are expected to result from import tankering of crude oil. An unknown number of oil spills are expected to occur as a result of oil and gas activity in state-owned coastal areas.

About 19,056 exploratory/development wells, 573 platforms, and 12 pipelines are estimated for this area with all Federal OCS resources developed. Currently, there are about 2,200 platforms on the Federal OCS and an unknown number of platforms in state waters. An unknown number of additional structures may be built as a result of resource development in state-owned coastal areas. Several hundred miles of pipelines exist in the Federal OCS and in state waters, and several additional pipelines will probably be constructed from existing leased tracts. Non-OCS-related vessel and tanker traffic will add pollutants to offshore waters probably to a greater degree than oil and gas activities from this alternative.

Alternative I-1 contributes less than 13 percent of the oil spills greater than 1,000 bbl: less than 21 percent of the oil spills greater than 10,000 bbl; less than 7 percent of the wells and 13 percent of the plantforms; and probably less than 25 percent of the oil/gas vessel traffic, but does not contribute significantly to the other impact agents discussed above.

Since the non-OCS-related impact agents have a greater level of impacts on offshore water quality, the contribution of Alternative I-1 to cumulative impacts on the offshore water quality is very low, whether all resources offshore the Central Gulf are leased and developed or only the resources described for Alternative I-1 are developed.

c) Impacts on Shipping and Navigation

The major impacts to shipping and navigation that can be expected to occur as a result of OCS oil and gas activities would stem from the construction of offshore structures on the OCS during development and production phases. Navigation or operational errors in the vicinity of these structures may result in collisions. Impacts which result from any such collisions include injury, loss of life, spillage of oil and release of debris, including all or part of a rig, platform, or ship. The release of a ship's cargo may present a serious threat to the environment if the cargo were a toxic chemical, crude oil, or refined oil product.

It is expected that during the first phase of oil and gas exploration there will be a slight negative impact on ship traffic, which will be short term in nature, until traffic adjusts to new structure locations. Some conflicts may arise with vessel movements in the vicinity of major traffic areas. Additional numbers of industry service boats, barges, and drilling and mud ships will not be traveling in the customary traffic patterns of open water shipping. This expected increase of oil and gas related vessel traffic and their patterns of movement will increase the probability of collision in area within/across existing lanes of vessel traffic.

During the exploration and production phase of oil and gas development, service vessels traveling between the coast and offshore sites during normal supply and work crew transport will result in an increase in ship traffic in the area's harbors, traffic lanes, and the offshore region. Slow-moving vessels engaged in trenching and pipe laying activities would also be operating in the area during the development phase. Pipeline construction operations involve a lay barge, one to three tugboats, and several pipe supply vessels. Impacts would be limited to the time required to lay the pipeline, and prior knowledge of the precise location of the pipeline laying operations at a given time would enable each vessel to avoid this ongoing work. Trips by service vessels will continue throughout all phases of OCS operations. However, as exploratory and development related activities decline, associated material transport and service trips will also decline. The remaining production related trips—worker transport, supply, and service—will become standard. These trips will be primarily directed between onshore operations bases and offshore production areas. As a result of the five year schedule sales, vessel traffic in the Central Gulf will increase by 6%.

The OCS Lands Act authorizes the Coast Guard to promulgate and enforce marking requirements for rigs and platforms, and OCS Operating Order No. 1 requires identification marking of structures of abandoned subsea objects.

Due to the existing network of fairways in the Central Gulf, traffic coordination and regulation by the U.S. Coast Guard, and the issuance of permits for the erection of structures on the OCS by the Corps of Engineers, vessel to vessel collisions and vessel collisions with OCS structures have been very few. Particularly, in consideration of over 80,000 ships crossing the Gulf waters each year, and the 2,500 structures existing on the OCS, the level of probability of a collision is very low. Presently, the probability of a vessel making a trip across the Central Gulf colliding with an OCS structure adjacent to a fairway is 1:89,000 (one accident in 89,000 vessel trips).

From 1963 to 1977, there were only 12 major collisions with OCS structures, eight of these occurred at night. Only one incident involved casualties. This was the Globtik Sun/Chevron Platform collision where six tanker crewman died. At least six of the accidents involved foreign flag vessels. The Hunt Oil Company's Platform "A", located at Eugene Island, Block 63, was involved in two accidents in a period of 16 months. This platform is located near an existing high traffic area and illustrates the problem of exploration and production activities near shipping lanes.

While the number of offshore structures in the Gulf of Mexico has increased to over 2,500 in 1981, the number of accidents per structure vessel trip has decreased. The chances of a vessel with draft over 18 feet colliding with a new platform constructed adjacent to a fairway as a result of all sales in the five-year schedule is: 1:400,000 (one accident in 400,000 vessel trips).

Accident history in the Gulf shows that the 14 year average of vessel collision with platforms is 0.9 accidents/year. It is assumed that only 5% of existing platforms will be near fairways, and thus, only 5% of future platforms installed will be adjacent to fairways. Also, assume that there are 80,000 trips across the Gulf per year by vessels with a draft of 19 feet or greater (*Waterborne Commerce of the United States*, U.S. Army Corps of Engineers, Calendar Year, 1979). Therefore, with a 0.9 accident/year rate for 80,000 trips, the present probability is one accident in every 89,000 vessel trips. For the five-year schedule assume that of the 570 platforms to be installed, 5% or only 30 will be located near fairways in the Gulf. The probability of a vessel colliding with one of these 30 platforms is 1:400,000. The cumulative impact of the five-year schedule of sales and the existing platforms, will increase the number of accidents by 22% to 1.1 accidents/year. Therefore, 1.1 accidents/year as a result of 80,000 trips yield a probability of one accident in every 73,000 vessel trips.

Conclusion The placement of structures on the OCS is presently regulated in all existing and proposed OCS operating areas, and navigation of OCS and non-OCS vessels is regulated seaward of major port areas. With proper enforcement of existing regulations and a continued use of the Gulf's network of established fairways, conflicts will be minimal as they have been in the past, and overall impacts will be low.

Cumulative Impacts In the event that all tracts offshore the Central Gulf are leased and developed during the life of the proposal, there will still be no significant conflicts with other uses of the OCS.

During the life of the proposal, the expected number of oil spills is 8.5 spills greater than 1,000 bbl and 1.5 spills greater than 10,000 bbl. An additional 16 oil spills greater than 1,000 bbl and five spills greater than 10,000 bbl are expected to result from import tankering of crude oil. An unknown number of oil spills could occur from development in state tidelands. A total of about 24 oil spills greater than 1,000 bbl are expected; however, it is unlikely that multiple spills would occur in the same area. The cumulative impacts of these oil spills on navigation and shipping is expected to be very low.

About 19,056 exploratory/development wells, 573 platforms, and 12 pipelines are estimated for this area with all Federal OCS resources developed. Currently, there are about 2,200 platforms on the Federal OCS and an unknown number of platforms in state waters. An unknown number of additional structures may be built as a result of resource development in state-owned coastal areas. Several hundred miles of pipelines exist in the Federal OCS and in state waters, and several additional pipelines will probably be constructed from existing leased tracts which could cause impacts and/or use conflicts, even though they would be of a very temporary and minor extent.

The proposal contributes less than 13 percent of oil spills greater than 1,000 bbl; less than 7 percent of the wells and 13 percent of the platforms; less than 20 percent of land use; and less than 25 percent of the oil/gas vessel traffic.

In all cases, the oil/gas related activities present a very small proportion of traffic potentially interfering with shipping and navigation.

Since the non-OCS-related impact agents have a greater level of impact on shipping and navigation, the contribution of Alternative I-1 to cumulative impacts on these parameters are expected to be very low, whether all resources offshore the Central Gulf are leased and developed or only the resources described for Alternative I-1 are developed.

d) Impact on Other Uses of the OCS

Potential impacts to commercial fishing and to recreational use of the OCS, as well as conflicts with other management plans for the OCS, are discussed in Sections V.D.3.a.3)&4).

(1) Military Uses

Eight percent or 3,500,000 acres of the Central Gulf are used for various military operations. In the two warning areas the activities include the firing of live weapons air-to-air and air-to-sea by aircraft, aircraft tests and operations, flight training, and sonar buoy placement. Appropriate OPAREA manuals and instructions delineated the major areas and type of activity permitted within each. The military operating areas are also detailed in the U.S. Coast Pilot series and maps published by the National Ocean Survey (NOS). Weekly "Notice to Mariners" delineate the projected use of the areas. A high impact is expected.

Conclusion The potential for conflict between the military uses and oil and gas development is high.

(2) Deepwater Ports

OCS oil and gas activities resulting from the five-year leasing plan will not adversely impact deepwater ports established, approved, or proposed in the Gulf of Mexico. For the established Louisiana Offshore Oil Port (LOOP) fairways and anchorage areas already exist. In accordance with Coast Guard and Corps of Engineers regulations, structures may not be erected within, but are restricted to areas adjacent to, these fairways, anchorages, and safety zones. Also, pipelines must conform to crossing and burial specifications.

Conclusion The potential for conflict between deepwater port operations and OCS oil and gas activities is expected to be very low.

Cumulative Impacts In the unlikely event that all tracts offshore the Central Gulf are leased and developed during the life of the proposal, there will still be no significant conflicts with other uses of the OCS, except military USGS which would be high.

During the life of the proposal, the expected number of oil spills is 8.5 spills greater than 1,000 bbl and 1.5 spills greater than 10,000 bbl. An additional 16 oil spills greater than 1,000 bbl and five spills greater than 10,000 bbl are expected to result from import tankering of crude oil. An unknown number of oil spills could occur from development in state tidelands. A total of about 24 oil spills greater than 1,000 bbl are expected; however, it is unlikely that multiple spills would occur in the same area. The cumulative impacts of these oil spills on other uses of the OCS are expected to be low.

About 19,056 exploratory/development wells, 573 platforms, and 12 pipelines are estimated for this area with all Federal OCS resources developed. Currently, there are about 2200 platforms on the Federal OCS and an unknown number of platforms in state waters. An unknown number of additional structures may be built as a result of resource development in state-owned coastal areas. Several hundred miles of pipelines exist in the Federal OCS and in state waters, and several additional pipelines will probably be constructed from existing lease tracts which could cause impacts and/or use conflicts, even though these would be of a very temporary and minor extent.

The proposal contributes less than 13 percent of oil spills greater than 1,000 bbl, less than 21 percent of oil spills greater than 10,000 bbl, less than 7 percent of the wells, 13 percent of the platforms, less than 20 percent of land use, and less than 25 percent of the oil/gas vessel traffic.

In all cases, the oil/gas related activities present a very small proportion of OCS traffic potentially interfering with other uses on the OCS.

Since the non-OCS-related impact agents have a greater level of impact on the other uses of the OCS, the contribution of Alternative I-1 to cumulative impacts on these parameters are expected to be high whether all resources offshore the Central Gulf are leased and developed or only the resources described for Alternative I-1 are developed.

e) Impacts on Land Use

(1) Service or Support Bases

Six new bases and the expansion of 25 existing bases requiring 238-532 acres are assumed for Alternative I-1. A recent study by the FWS (Gordon et al. 1981. page 4) estimated approximately 125 bases exist in the Central Gulf. Additionally, there are two proposed supply bases in Harrison County, Mississippi. As in the Western Gulf, it is difficult to determine the exact number of new bases which would actually require land, whether existing bases can service additional needs, or whether the existing bases will be expanded since production has been declining in the Gulf of Mexico over the past few years, and it is expected that the additional services may utilize available capacity. In any event, the level of industry activity will be a major determining factor.

(2) Pipeline Landfalls

For Alternative I-1 it is assumed 2 gas pipelines requiring one acre each, will landfall in the area. The Central Gulf has an extensive network of pipelines and it is entirely possible that pipes could tie into the existing system. The route and landfall site will be determined so as to minimize distance and consideration of seabottoms anchorages, shoreline, environmentally sensitive areas, etc. CZM, IPP, and local siting policies and plans should mitigate impacts which are expected to be minimal. Also, pipeline sites are returned to preconstruction status.

(3) Marine Terminals

It is anticipated that the need for additional marine terminal facilities will be met by expanding existing marine terminals.

(4) Gas Processing Plants

For Alternative I-1, it is assumed 2 new plants may be necessary utilizing 500-750 acres of land. There are numerous plants in the Central Gulf, many of which are operating under capacity. It is possible any additional requirements could be met by expansion of existing plants.

Conclusion. Any impact which results from land usage for pipelines and facility sitings is expected to be of low significance due to mitigation through regulations and permitting requirements. The overall level of impacts is expected to be very low.

Cumulative Plants. In the event that all areas of the Central Gulf Federal OCS are leased and all resources are subsequently developed over the extent of the proposal, the expected level of land use would be approximately 2000 to 4000 acres. An unknown amount of land could be used to support nearshore oil/gas development in State waters. Commercial and residential construction within coastal areas and expansion of existing ports to handle commercial impacts will have a much higher level of impact on land use than OCS related impacts. The cumulative effect of these developments and ancillary activities is expected to result in a moderate level of impacts to land use in the Central Gulf region.

Since other non-OCS-related impact agents have a greater impact on land use, the contribution of the proposal to cumulative impact is low weather all resources offshore the Central Gulf are leased and developed or only the resources described for Alternative I-1 are developed.

(f) Impacts on Cultural Resources

For a discussion of impacts refer to the Eastern Gulf of Mexico, Alternative I-1. Bottom disturbing activities such as the emplacement of platforms, the anchoring of exploratory drilling vessels and support vessels, and the laying of pipelines could partially or totally destroy, or make it difficult to locate and study the remans of more than 500 pre-19th century ships know to have gone down in the Gulf of Mexico. In addition, an unknown number of prehistoric dwelling sites are believed to be located beneath thin surface sediments in the Gulf and these could be damaged by the same activities. Impacts from OCS activities on underwater cultural resources would be moderate.

Coastal perhistoric sites would possibly be contaminated should an oil spill occur. Physical alteration or destruction of sites may also occur as a result of a clean-up operation. There is a moderate risk for such oilspill ipacts to occur as 1.1 spills of greater than 1000 barrels. Coastal National Register sites such as forts under this alternative and lighthouses, as well as numerous coastal historic sites not on the National Register, would possibly be contaminated should an oilspill occur. Physical alteration or destruction of historic sites may also occur, but is highly unlikely, as a result of clean-up operations. Oil contamination would only be a temporary impact to most historic sites.

Conclusion. Moderate impacts could be expected on cultural resources.

Cumulative Impacts. In the unlikely event that all tracts offshore the Central Gulf are leased and developed during the life of the proposal, the expected number of oilspills is 8.5 spills greater than 1,000 bbl. and 1.5 spills greater than 10,000 bbl. An additional 16 oilspills greater than 1,000 bbl and five spills greater than 10,000 bbl are expected to result from impact tankering of crude oil. An unknown number of oilspills could occur from development in State Tidelands.

Several hundred miles of pipelines exist in the Federal OCS and state waters and several additional pipelines will probably be constructed from existing leased tracts which could impact cultural resources.

Approximately 2000 to 4000 acres of land will be required with all Federal OCS resources developed. An unknown amount of land could be used to support oil/gas development in state waters. Commercial and residential construction and dredging within coastal areas also could impact cultural resources. The overall cumulative impact of this construction and ancillary activities is expected to result in a high level of impacts on cultural resources in this region.

The proposal contributes less than 13 percent of oil spills greater than 1,000 bbl, less than 21 percent of oil spills greater than 10,000 bbl; less than 7 percent of the wells, 13 percent of the platforms and less than 20 percent of land use. Since the non-OCS-related impacts probably have a greater impact on cultural resources, the contribution of the proposal to cumulative impacts is moderate whether all resources offshore the Central Gulf are leased and developed or only the resources described for Alternative I-1 are developed.

2) Impacts of Special Concern

a) Impacts on Commerical Fisheries

For a general discussion of Gulf of Mexico fish and shellfish landings, fishery biology, and the effects of oil and gas activities, see the discussion under Eastern Gulf of Mexico, V.D.4.a.2)a).

In the Central Gulf for Alternative I-1 the area foreclosed by platforms (120 platforms expected) as percent of fishing area is expected to be from .003-.005 percent or about 55,700 acres. This is considered to be an insignificant percentage of the total fishing area, and a low impact on fishing activity is expected. One port, Morgan City, Louisiana, may become crowded. This would probably be short-lived; a moderate impact is expected. The fishing area covered by geologic area is from 90-100 percent. There are about 1532 platforms in the Central Gulf now and construction of approximately 77 more would not significantly contribute to gear conflicts. Gear conflicts are largely compensated through normal legal routes or through the Fishermen's Contingency Fund. The highest expected number of oil spills in this planning area for Alternative I-1 is five and the conditional probability is 0.17 percent that a spill will contact finfish or shellfish nursery grounds or shellfish harvest areas if they are contacted by an oil spill.

Although the expected number of spills is fairly low and the probability is very low, the potential is there for a high impact on commercial fishery resources should oil contact finfish and shellfish nursery grounds or shellfish harvest areas. In that event, there would be high, localized mortality of juvenile commercial finfish and shellfish, habitat destruction and interference with the actual havest of these species. Repeated contact of these areas by one or more spills would result in a more severe impact on commercial fishery resources. A large oil spill would adversely affect the commercial fishing industry due to loss of income if important fishing areas would have to be closed during the principal harvest season. These adverse impacts would be short term but would have the potential for serious localized economic losses.

Conclusion Moderate impacts are expected on fishing activities. However, there could be a high impact on commercial fishery resources and on the commercial fishing industry should an oil spill contact major finfish or shellfish nursery grounds or major shellfish harvest areas. The likelihood of such an event occurring is low.

Cumulative Impacts. In the event that all tracts offshore the Central Gulf are leased and developed during the life of the proposal, the expected number of oil spills greater than 1,000 barrels is 8.5 and the expected number of oil spills greater than 10,000 bbl is 1.5. Additionally, 16 oil spills greater than 1,000 bbl and five oil spills greater than 10,000 bbl are expected to result from import tankering of crude oil. An unknown number of oil spills are expected to occur as a result of oil and gas activities in state-owned coastal areas. Although unlikely, the possibility exists that a relatively large oil spill contacting estuarine nursery areas would be followed by another one in the same area. The cumulative effects of successive oil spills on estuarine nursery areas are expected to be moderate to high and could be relatively long-term.

Five hundred and seventy three platforms, 19,056 exploratory/development wells, and 12 pipelines are estimated for this area with all Federal OCS resources developed. Currently, there are about 2200 platforms on the Federal OCS and an unknown number of platforms in state waters. Several hundred miles of pipelines exist in the Federal OCS and state-owned waters, and several additional pipelines will probably be constructed from existing leased tracts which could impact commercial fishing activities. An unknown number of additional structures may be built as a result of resource development in state-owned coastal areas. The total fishing area that will be lost throughout the planning area from these structures will be very small.

Vessel traffic from existing and future oil and gas activities, gear conflicts, and crowding of ports associated with total development of oil and gas resources may create a moderate to high impact on the commercial fishing industry. The commercial fishery is also stressed for other reasons, such as fluctuations in fish populations, changes in market conditions, and restrictions on finfish and shellfish harvests. These other sources may cause moderate to high economic impacts on the industry. Overall, the expected regional impacts on commercial fisheries due to cumulative impacts from Alternative I-1 are moderate to high.

The proposal contributes less than 13 percent of the oil spills greater than 1,000 bbl, less than 21 percent of the oil spills greater than 10,000 bbl, less than 7 percent of the wells, 13 percent of the platforms, and perhaps 25 percent of the oil and gas vessel traffic, but does not contribute significantly to the other impact agents discussed above. Non-OCS related impact agents have a sizable impact on the commercial fishery and the contribution of the proposal to cumulative impacts to the fisheries is moderate, whether all resources offshore the Central Gulf are leased and developed or only resources described for the alternative are developed.

b) Impacts on Endangered Species

In the Central Gulf of Mexico Planning Area, Alternative I-1 proposes two GOM and four CGOM sales. The potential production and transportation of oil resulting from this proposal could result in 6 spills with a 31 percent probability of contacting shore within 10 days. About 10-15 percent of the approximately 860 miles of shoreline in the Central Gulf is potential endangered species habitat and small sections (3-15 miles) of this habitat could be adversely affected by oil spills resulting in a low level impact on brown pelicans near Chandeleur and Queen Bess Islands. Onshore facilities which may be constructed as a result of this proposal would require about 1,150 to 2,094 acres of land in developed coastal areas and is not expected to significantly affect endangered species habitat.

Conclusion. In the Central Gulf, Alternative I-1 is expected to have a very low level impact on endangered species from oil spills, and no significant adverse effects on their populations or habitats are expected.

Cumulative Impacts. In the unlikely event that all tracts offshore the Central Gulf are leased and developed during the life of the proposal, the expected number of oil spills is 8.5 spills greater than 1,000 bbl and 1.5 spills greater than 10,000 bbl. An additional 16 oil spills greater than 1,000 bbl and five spills greater than 10,000 bbl are expected to result from import tankering of crude oil. An unknown number of oil spills could occur from development in State Tidelands. A total of about 24 oil spills greater than 1,000 bbl is expected, however, it is unlikely that multiple spills would occur in the same area. The cumulative impact of these oil spills on endangered species is expected to cause a low level, short-term, local impact.

Vessel traffic from existing and future oil/gas activities may create very low impacts to endangered species. The use of ports and harbors assoicated with total development of oil/gas resources offshore the Central Gulf (Federal and State) are not expected to be significantly different from the impacts described above for the proposal.

Endangered species are also stressed from other sources such as fluctuations in food resources and weather, pesticides, and loss of habitat. Overall, the expected regional impacts on endangered species due to cumulative impacts is low.

Alternative I-1 contributes less than 13 percent of the oil spills greater than 1,000 bbl, less than 21 percent of the oil spills greater than 10,000 bbl, and approximately 15 percent of the oil/gas vessel traffic, but does not contribute significantly to the other impact agents discussed above.

Since the non-OCS-related impact agents have a greater level of impact on endangered species, the contribution of Alternative I-1 to cumulative impacts on these species is very low whether all resources offshore the Central Gulf are leased and developed or only the resources described for Alternative I-1 are developed.

c) Impacts on Habitats and Resources of Special Concern

In the region of the shelf break the Central Gulf is characterized by a series of "topographic highs", geologic features rising out of 100-200 m to various depths and trending east-west along the break. Many of these are the surface expression of salt domes, and nearly all are hard, rocky outcrops. Many are drowned coral reefs. The hard, more or less vertical surfaces provide habitat and food for a wide variety of organisms, including corals, molluscs, crustaceans, sponges, crinoids, echinoderms, and algae; and it has been found, largely through BLM-funded studies, that, at similar depths, all of these banks contain similar biological communities. The East and West Flower Garden Banks off Texas rise closer to the water's surface than the others and are the only two which contain living hermatypic (reef-building) corals. These high value biotic communities would be severely damaged if oil and gas operations were to take place right on them. The impacts would be due to two aspects of oil and gas operations: first, the drilling muds and cuttings will settle on and smother the benthic organisms within 100 m or so of the well site, and some constituents of the muds may be toxic to organisms within approximately 25 m of the discharge point. Second, such operations will cause destructive mechanical damage due to anchors, drilling itself, submersible and jack-up rig damage, and the installation of pipelines. While the area of such damage will be small, the areas of unique and productive biota are also small, and thus the damage to those ecosystems will be quite high, but avoidable if the biological stipulations are applied.

Stipulations have been developed to protect these valuable and unique biological resources from the impacts of oil and gas activities. It is believed that application of these restrictions, will reduce such potential impacts to an insignificant level (see also Section IV.B.3.c.).

There are several banks which have less relief and rise out of shallower water than those mentioned above, and which are subjected to a much higher level of turbidity and sedimentation. These banks currently receive adequate protection by stipulations on existing leases prohibiting any activity within the boundary of the bank itself (usually be the deepest closing isobath of the bank).

Live bottom areas, including coral reefs, are biologically productive habitats in the Gulf of Mexico which are particularly sensitive to adverse effects from offshore oil and gas development. However, because of their discrete nature, they can be protected using mitigating measures which have been applied in the past. This region is considered to be moderately sensitive to oil spill effects upon bird populations and spawning and other fisheries habitats and resources. It is estimated that the proposal will result in about .3 large oil spills in the Gulf of Mexico.

Conclusion. Oil and gas activities on these areas will cause moderate and long-term damage to these unique and productive areas. Each well location will impact up to eight acres of benthic habitat. Impacts will be moderate.

Cumulative Impacts. If all tracts offshore the Central Gulf are leased and developed during the life of the proposal, the expected number of oil spills greater than 1,000 bbl is 8.5 and the expected number of oil spills greater than 10,000 bbl is 1.5. Additionally, 16 oil spills greater than 1,000 bbl and five oil spills greater than 10,000 bbl are expected to result from import tankering of crude oil. An unknown number of oil spills are expected to occur as a result of oil and gas activities in state-owned coastal areas. About 19,056 exploratory/development wells, 573 platforms, and 12 pipelines are estimated for this area with all Federal OCS resources developed. Currently, there are about 2200 platforms on the Federal OCS and an unknown number in state waters. An unknown number of structures may be built as a result of resource development in state-owned coastal areas. Several hundred miles of pipelines exist on the Federal OCS and in state-owned waters and several additional pipelines will probably be constructed from existing leased tracts. This could cause impacts on habitats and resources of special concern. Although unlikely, the possibility exists that a relatively large oil spill contacting estuaries would be followed by another one in the same area. The cumulative effects of successive oil spills on coastal ecosystems and nursery areas are expected to be high and could be relatively long-term. Furthermore, oil and gas well operations, successive well blowouts, spillage of drilling muds and cuttings, and the accidental introduction of toxic chemicals into waters close to hard bottom areas over the life of the proposal would cause relatively long-term and high cumulative impacts.

Vessel traffic in the estuaries will cause pollution and erosion of this habitat. Commercial fishing vessel traffic will have greater impacts on the estuaries than does oil/gas related vessel traffic.

Natural subsidence, urbanization and construction projects, and the dredging and maintaining of coastal waterways contribute significantly to long-term cumulative impacts on estuaries and nursery areas.

Alternative I-1 contributes less than 13 percent of the oil spills greater than 1,000 bbl; less than 21 percent of the oil spills greater than 10,000 bbl, less than 7 percent of the wells, and 13 percent of the platforms; less than 20 percent of the land use and probably less than 25 percent of the oil/gas vessel traffic, but does not contribute significantly to the other impact agents discussed above.

Although the non-OCS-related impact agents have a greater level of impact on habitats and resources of special concern, the contribution of Alternative I-1 to cumulative impacts on habitats and resources of special concern is moderate, whether all resources offshore the Central Gulf are leased and developed or only the resources described for Alternative I-1 are developed.

d) Impacts on Air Quality

Air Quality: A discussion of the primary factors used in assessing onshore air quality impacts which may result from OCS-related activities and the method employed in quantifying the impact on this planning area are described in Section V.A.3. of this document.

Information on nonattainment areas in the planning area is provided in Table V.D.5.a.2)d)-1.

Table V.D.5.a.2)d)-1. Nonattainment areas within the Region.

State	Area	Nonattainment Pollutants
Alabama	Mobile area	TSP
Louisiana	AWCR 106	O_3
	St. Mary Parish	O_3

It is estimated that 410 exploratory wells will be drilled to identify the resources and 926 development/production wells and 77 platforms to develop the resources under this alternative. It was assumed, for the purposes of analysis, that production from an average platform would be 0.02 million barrels of oil and 0.2 billion cubic feet of gas per year. The oil production in the region is assumed to be transported by pipeline. Estimated representative emissions for exploration/development are provided in Table V.D.1.a.2)d)-2. This information is derived from Table V.A.3-1.

Table V.D.1.a.2)d)-2. Estimated Representative Emissions

Activity	Production at Platform (tons per year)				
	VOC	NO_X	TSP	SO_2	CO
oil/gas	0.2	3	-	-	1
barging	none	-	-	-	-

It is estimated that OCS facilities located within 20 miles from shore will require emission controls. Some platforms are expected to be located within 20 miles of shore and require emission controls; however, most will be sited beyond 20 miles from the coast. Two new gas processing plants are anticipated for the proposal (see Land Use, Section V.D.5.a.1)e)).

A moderate impact is expected from routine emissions. Numerous gas processing plants are projected and much of the region is nonattainment for O_3. Larger platforms close to shore could also impact the onshore area. If a blowout, oil spill, or fire were to occur at a platform near shore, short-term violations of several NAAQS could occur, depending on the type and duration of the accident.

Any emission sources which would adversely affect the onshore air quality would be subject to mitigation required by EPA and the State, if located onshore, or by DOI, if located on the OCS. ERG (1981) discusses mitigation measures for OCS facilities.

Conclusions A moderate level of impact is expected to result from Alternative I-1.

Cumulative Impacts It is estimated that a total of 3.24 billion barrels of oil and 34.92 trillion cubic feet of gas exist in the entire Central Gulf Federal OCS planning area. In the event that total development of all Federal reserves occurs over the life of this proposal, 573 new platforms

with 19,056 wells would be required. It is very unlikely that this magnitude of development will occur over the life of this proposal.

The major influencing factors affecting the onshore air quality along the Central Gulf of Mexico as a result of this development are:

1) the number of new wells drilled
2) the timing of the activities
3) the location of the platforms and
4) the instantaneous local meteorological conditions.

The offshore development of this proposal contributes moderately to regional cumulative air quality and the onshore development, in the form of increased numbers of gas processing plants, contributes from moderately to very high to the regional and local cumulative air quality.

The increase in oil and gas development delineated in this proposal will occur as the entire Gulf of Mexico region grows in population as a result of unrelated industrial growth in the area. In most cases, oil and gas activities will be a very small part of this overall growth. The cumulative impact of this overall growth could increase ambient pollutant concentrations. Future economic growth in communities along the Gulf could be restricted by increasing level of pollutants approaching Federal, and State air quality standards.

If all the proposed gas processing plants are installed high regional and local cumulative air quality impacts would result. If the oil and gas produced as a result of this proposal replaces oil and gas presently being processed in onshore facilities (but coming from decreasing yield fields, platforms, or impacts) no cumulative impact to air quality would result; production levels at onshore facilities would remain stable with only the substitution of one source of raw product for another source.

Overall, cumulative regional air quality impacts are expected to be high; local impacts will range from moderate to very high. However EPA rules associated with the Clean Air Act and the DOI air quality rules have provisions to minimize these impacts.

e) Impacts on Recreation

A major portion of the Mississippi and Alabama shorefront consists of barrier peninsulas, islands, and coastal shorefronts with primary recreation destinative beaches exposed to OCS leasing areas. Except for a 10 mile stretch in the vicinity of the shorefront in the Central Gulf west of the Mississippi River the shorefront consists of inaccessible coastal bays with marshy shorefront. The accessible beach shorefronts and designated parts of the Barrier Islands beaches (Gulf Islands Natural Seashore, Grand Isle, Mississippi Shorefront, Gulf Shores) are devoted to concentrated recreation use and comprise almost 50% of the shorefront in the Central Gulf.

Existing storage and supply bases, staging areas, fabrication and refinery facilities in the coastal areas of Louisiana and Mississippi should be adequate to accomodate most of the needs envisioned in the various alternatives included in the proposed 5 year schedule. Some existing facilities will likely be expanded, updated, and replaced depending on the nature and extent of oil and gas finds which may result from continued development of petroleum resources in the Central Gulf. None of these onshore support requirements are likely to have a significant adverse effect on coastal recreation plans and programs.

Thirty years of United States offshore development in the Central and Western Gulf of Mexico have had no documented major long-term adverse effects on shoreline recreation stemming from major or acute oil spills. However, as indicated previously, Texas beaches suffered decreased visitation of about 25% in two months in the summer of 1979 over 1978 levels, due to the Campeche spill. Although tar balls have been a chronic nuisance to shoreline or beach aesthetics and use in the Central Gulf, there is no evidence which would indicate offshore petroleum development is a major contributor to that problem.

Most of these spills may never reach the shore because most of the new oil likely to be discovered in the Central Gulf will be far offshore. Spills which acutely impact primary recreational shorefront beaches will cause short-term pollution and disturbance of the resource base and temporary loss and displacement of water related near-shore recreational activities. Ultimately, the degree of adverse short-term impact from an oil spill is dependent upon the location, size, type, and persistance of the spill, time of year and success of containment and cleanup efforts.

The major recreational activity which commonly extends out into the Gulf of Mexico where OCS leasing occurs is recreational fishing. Some scuba diving also takes place offshore, especially in the Central Gulf where underwater visibility in the nearshore marine environment is poor. Experience has shown, especially in the Central Gulf off Louisiana, that oil and gas development offshore significantly enhances deep sea recreational fishing and scuba diving. Major semi-permanent installations such as easy to locate, multi-well platforms placed in proposed lease tracts would attract and concentrate sport fish and inevitably sport fishermen. The literature is replete with documentation on the reefal effects of artificial structures placed in the marine environment. The degree to which offshore oil and gas development will affect recreational fishing is believed to be related to such factors as the number and size of structures erected, the length of time they are in place, and the distance they are from shore. Water depth, oceanic conditions, and bottom conditions around an offshore platform might also affect the recreational fishing associated with oil and gas structures offshore.

With more than 3,000 emergent oil and gas structures currently existing in the Gulf of Mexico, the projected addition of several hundred platforms will be a small increment and is more likely to replace offshore structures which are being removed from terminated leases. The most dramatic impact on sports fishing would likely occur if new leases in the Eastern Gulf off Florida or the western Gulf off southwest Texas led to platform development within 40 miles of shore.

Conclusion. This proposal is expected to contribute to the maintenance and minimal expansion (by depth and distance from shore) of offshore recreational fishing by stimulating the development of approximately 77 new platforms which will function as artificial reefs attracting fish and fishermen. Temporary adverse impacts to some shoreline recreational areas, especially beaches and designated environmental preservation areas is expected from trash washing ashore, minor intermittent construction activities affecting coastal areas in-shore and the 5 major oil spills from exploration, production, and transportation activities could cause temporary closure of primary impact beachfront recreation areas. The overall level of impact on recreation is expected to be low to moderate.

Cumulative Impacts. In the unlikely event that all tracts offshore the Central Gulf are leased and developed during the life of the proposal, the expected number of oil spills is 8.5 spills greater than 1,000 bbl and 1.5 spills greater than 10,000. An additional 16 oil spills greater than 1,000 bbl and five spills greater than 10,000 bbl are expected to result from tankering of imported crude oil. An unknown number of oil spills could occur from development in State Tidelands. A total of about 24 oil spills greater than 1,000 bbl are expected, however it is unlikely that multiple spills wouls occur in the same area. The cumulative impact of these spills on recreation is expected to cause a moderate level of local impact.

About 573 platforms and 12 pipelines are estimated for this area with all Federal OCS resources developed. Currently there are about 2200 platforms on the Federal OCS and an unknown number of platforms in state waters. An unknown number of additional structures may occur as a result of resource development in State Tidelands. Several hundred miles of pipelines exist in the Federal OCS and state waters and several additional pipelines will probably be constructed from existing leased tracts which could impact recreation.

Approximately 2000 to 4000 acres of land will be required with all Federal OCS resources developed. An unknown amount of land could be used to support oil/gas development in state waters. Commerical and residential construction and dredging within coastal areas also could impact recreation. The overall cumulative impact of this construction and ancillary activities is expected to result in a moderate level of impacts on recreation in this region.

The proposal contributes less than 13 percent of oil spills greater than 1,000 bbl; less than 21 percent of oil spills greater than 10,000 bbl; less than 13 percent of the platforms; and less than 20 percent of land use. Since the non-OCS-related impacts probably have a greater impact on recreation, the contribution of the proposal to cumulative impacts is low to moderate whether all resources offshore the Central Gulf are leased and developed or only the resources described for Alternative I-1 are developed.

f) Impacts of Socioeconomic Factors

The conditional mean estimates of resources recoverable from the Central Gulf region as a result of the proposed leasing schedule are .41 bbbls of oil and 4.38 tcf of natural gas. Based on analysis from Sales 67/69 FEIS, peak employment due to the proposed schedule will be about 24,600 people. New resident employement and population in the peak year will be about 4,900 and 10,300 people, respectively.

Activity in the Central Gulf is expected to require 6 new shorebases and the expansion of 25 existing ones which may be located throughout the entire Louisiana coastal area, along the Mississippi Gulf Coast, and at Mobile Alabama. Two new gas processing plants may result in the Central Gulf area. In addition 12 existing gas processing plants in the Central and Western areas may be expanded.A more detailed analysis of these is presented in the land use portion of this report.

The proposed schedule of sales is expected to result in low negative impacts on tourism beaches in Louisiana, Mississippi, or Alabama as a result of related oil spills. The expected number of spills of 1,000 barrels or more will be about 1.1.

Also, negative impacts on port acitivity within this region due to OCS-related marine traffic should be successfully minimized by existing federal, state, and local jurisdictional authorities and regulations. The Central Gulf region recorded over 468,000 vessel trips to and from major ports in 1979, according to U.S. Army Corps of Engineers data. Major waterway user conflicts were effectively prevented or resolved by the appropriate authorities. This success is expected to continue in the future.

Conclusion. New resident population and employment growth in the Central Gulf due to the proposed schedule is not expected to create major infrastructure stresses. The negative impacts on tourism along the Central Gulf coast as a result of a major oil spill associated with the proposed schedule is expected to be low. Also, adverse impacts on port activity will be negligible. The overall level of impact is expected to be very low.

Cumulative Impacts In the event that all tracts offshore the Central Gulf are leased and developed during the life of the proposal, the expected number of oil spills is 8.5 spills greater than 1,000 bbl and 1.5 spills greater than 10,000 bbl. An additional 16 oil spills greater than 1,000 bbl and five spills greater than 10,000 bbl are expected to result from tankering of imported crude oil. An unknown number of oil spills could occur from development in State Tidelands. A total of about 24 oil spills greater than 1,000 bbl are expected, however, it is unlikely that multiple spills would occur in the same area. The cumulative impact of these spills on socioeconomic factors is expected to cause a low level of local impacts.

Approximately 2000 to 4000 acres of land will be required with all Federal OCS resources developed. An unknown amount of land could be used to support oil/gas development in State waters. Commerical and residential construction within coastal areas also could impact socioeconomic factors. The overall cumulative impact of the construction and ancillary activities is expected to result in a low level of impacts on socioeconomic factors.

The proposal contributes less than 13 percent of oil spills greater than 1,000 bbl; less than 21 percent of oil spills greater than 10,000 bbl; and less than 20 percent of land use. Since the non-OCS-related impacts probably have a greater impact on socioeconomic factors, the contribution of the proposal to cumulative impacts is very low whether all resources offshore the Central Gulf, are leased and developed or only the resources described for Alternative I-1 are developed.

3) Impacts on Other Management Plans

a) Marine Sanctuaries

There are no national marine sanctuaries in the Central Gulf of Mexico at the present time.

b) Coastal Zone Management

The description of this program is the same as Alternative I-1 for the Eastern GOM. All states in the Central Gulf have approved plans.

4) Unavoidable Adverse Impacts

a) Marine Habitats and Resources

In the Central Gulf of Mexico minor decreases in primary productivity due to the mortality or functional impairment of plankton, benthic organisms, seagrasses, and algae will occur in localized areas of high trubidities generated by drilling fluids disposal and bottom sediments suspended by pipeline laying and burying operations. The possibility exists that toxic materials used in mud mixtures may adversely affect some marine organisms in localized areas when the drilling fluids and cuttings are discharged; such effects will be short-lived.

Disruption will occur if fresh oil spills reach shallow sensitive biological features. Localized selective mortalities and functional impairment would probably occur, thereby altering the community structure for an unknown but probably short period of time.

Adverse low level impacts could occur to endangered brown pelicans. The most serious potential impacts would occur from major oil spills and chronic oil pollution.

b) Commercial Fisheries

Of the various types of fishing gear in use in the OCS areas, towed bottom gear such as trawls and dredges, as well as pots, have the greatest chance for operational conflicts with oil and gas activities. These conflicts are unavoidable in all OCS areas, as these fishing methods are common to all areas. However, losses can be compensated. Trawling

operations suffer interference and inconvenience from oil and gas operations in several ways. Trawl nets can become snagged on underwater stubs, causing damage or loss of the nets. Pots can also be lost in this manner. In addition, it is conceivable that snags could damage underwater production equipment or pipelines, causing a spill of oil and gas. Because safety equipment is installed which shuts in production when a loss of pressure occurs, the likelihood of a major spill resulting is considered very small. Less frequently, large objects which were lost overboard from petroleum industry boats, pipeline lay barges and platforms are caught by fishing gear resulting in damage to the gear and/or its catch of fish; however, frequency of occurrence of this type of incident is low.

Commercial fishermen would probably not harvest fish in the area of an oil spill, as spilled oil could coat or contaminate commercial fish species, rendering them unmarketable. This would be another adverse effect to commercial fishing.

c) Coastal Habitats and Resources.

For the Central Gulf planning area, the highest probability of an oil spill contacting land within 10 days, if one were to occur is 31%; and the highest expected number of oil spills occurring over the expected production life of the lease is 8.5. If an oil spill does contact coastal wetlands, adverse environmental impacts will be high. The entire coastline of this planning area, some 869 miles, can be affected by oil spills. Approximately 838 miles, or 96% of this coastline consist of coastal wetlands and are therefore susceptible to high adverse environmental impacts if oil contacts this habitat.

Beaches, barrier islands, wetlands, and other coastal ecosystems are located throughout the areas emcompassed by the proposed sales. If any of these coastal areas are contaminated by oil, an undetermined amount of fish and wildlife habitat (primarily birds) will be damaged. It is possible that a large number of deaths, particularly to birds, fish larvae and shellfish, would occur should a large spill reach shore.

The unavoidable short-term impacts associated with trenching and backfilling for pipeline construction include the uprooting of all plants and non-motbile animals in the path of the pipeline, thereby leaving a barren strip 9 to 12 meters wide. Some unavoidable damage may also be rendered to vegetation in adjacent areas by machinery used in the operation. The long-term impacts could include saltwater intrusion, changes in floral and faunal components, and a possible increase in marsh erosion if a canal is not backfilled.

In the event of an onshore oil pipeline leak or spillage at onshore facilities, it is inevitable that the vegetation would be affected to an extent that would be dependent upon the severity of the spill. While a small leak may do little damage, a severe leak may contaminate the substrate and kill the vegetation that comes into direct contact with the oil and several years may be required for recovery. Small animals in contact with the oil would probably be killed.

d) Socioeconomic Systems

The unavoidable adverse impacts in the Central Gulf associated with the proposed schedule will be generally the same as those discussed under Alternative I-1 for the Eastern Gulf region.

e) Recreation

The adverse impacts on recreation that could be encountered if the proposed sales proceed are: the temporary disruption of recreational areas caused by pipeline burial, the competition for land between recreation and OCS-related onshore facilities, the degradation of the aesthetic environment conducive to recreation, and the damage to recreational sites caused by an oil spill. The first three impacts could largely be mitigated through

careful site selection and by timing the construction of OCS facilities for the nonpeak season. When an oil spill occurs, the extent of the recreation impact is dependent upon the location and size of the spill, the time of year in which the spill occurs, and the degree of success of cleanup.

A major spill would largely preclude any recreational activity in the affected area. Should oil impact a beach, the recreational use of that beach will be eliminated or dislocated until cleanup procedures have been completed and the beach restored to a desirable, usable state. The use which the impacted beach would normally receive could be temporarily transferred to surrounding beaches (if available), which might cause crowding and ultimate denial of beach areas to some people. Oil spills could temporarily close marinas and boat launching facilities. This would deny some boaters the opportunity to participate in the activity. The spill could result in bird mortality which could affect hunting activities.

f) Air Quality

Unavoidable adverse impacts in the Central Gulf resulting from the proposal are assumed to be similar to those discussed for the Eastern Gulf in Section V.D.4.a.4).

g) Shipping and Navigation

A certain amount of interference between offshore structures and vessel traffic will occur as a result of the proposed sales. This could lead to an increase in accidents involving OCS vessels and structures. However, the probability of an accident per trip is low (1 in 400,000).

Very little navigational interference can be expected between ships utilizing established fairways. Coast Guard regulations regarding structure safety lights and horns, and ship safety regulations are important factors, also, in minimizing conflicts and preventing accidents between structures and vessels on the OCS. However, at night, in rough water, and in fog the potential for all accidents increases.

h) Water Quality

Normal offshore operations would have unavoidable effects to varying degrees on the quality of the surrounding water if the proposed sales are implemented. Drilling, construction and pipelaying would cause an increase in the turbidity of the affected waters for the duration of the activity periods, and, in the case of pipelines, could disturb settled pollutants. A turbidity plume, several hundred yards in length, could also be created by the discharge of drill cuttings and the adherent drilling fluids. This, however, would only affect waters in the immediate vicinity of the rigs. The discharge of treated sewage from the rigs and platforms would increase the levels of suspended solids, nutrients, chlorine, and BOD in a small area near the discharge points. Chronic spills from platforms and the discharge of formation waters will result in increases of the hydrocarbon levels and possibly trace metal concentrations in the water column. Overall, the effect will be the degradation of water quality around platforms, although the extent of the impact will extend only from a few meters to a few tens of meters from the platform site.

Unavoidable impacts to onshore water quality will also occur as a result of runoff from construction sites of new facilities, but these impacts will be localized in the vicinity of these sites, and of limited duration. Some additional impacts will accrue from increased sewage due to population growth in certain communities. All of these onshore impacts will be mitigated by regulation by state water quality boards acting under existing federal and state regulations and guidelines.

i) Cultural Resources

There is a small possibility that unknown archaeological and/or historic artifacts and sites exist within the proposed lease sale areas. Cultural resource surveys may not detect with certainty all such sites or artifacts. Those materials within undetected sites could be damaged or destroyed by subsequent oil and gas activity such as structure siting and anchoring.

Other damage to archaeological resources could come from oil contamination. Historical and archaeological materials soiled by an accidental oil spill may not survive subsequent cleaning and restoration efforts. Porous materials could be rendered unsuitable for carbon dating techniques. The probability of such a polluting event occurring and interacting with artifacts is considered low and the potential for significant resource destruction appears small.

5) Relationship Between Short-Term Uses of Man's Environment and the Maintenance and Enhancement of Long-Term Productivity

The principal short-term use of the leased areas in the Central Gulf under the proposed schedule would be for the production of .41 bbbls of oil and 4.38 tcf of natural gas. This activity would temporarily interfere with tourism in the region in the event of a major oil spill (1,000 barrels or more) contacting popular tourist beaches. The expected number of such spills within a 30-day period after an oil mishap is less than one. The expected economic impact based on such an occurrence estimate is low.

Also, OCS development in the Central Gulf has supported recreational and commercial fishing activities. This has stimulated the manufacture and sale of larger private fishing vessels and specialized fishing and recreational equipment. Additionally, commercial enterprises such as charter boats have become heavily dependent on offshore structures for satisfying recreational customers. These proposed sales will increase these incidental benefits of offshore development.

The 77 platforms expected to result from the proposed sales in the Central Gulf will help replace those expected to come out in the next 20 years where production has terminated. As the incidence of offshore fishing and diving has gradually increased in the past three decades, platforms (the focus of much of that activity) will eventually begin to gradually decline as mineral resources become depleted. In order to maintain the long-term productivity of site-specific, artificial locations attractive to fishermen and divers, some means, such as proliferation of artificial reef development programs, will need to eventually replace platform removals.

Finally, other short and long-term impacts in the Central Gulf associated with the proposed schedule are generally the same as those discussed under Alternative I-1 for the Eastern Gulf region.

6) Irreversible and Irretrievable Commitment of Resources

a) Mineral Resources

Same as Alternative I-1 for the Eastern GOM, except that .41 billion barrels of oil and 4.38 trillion cubic feet of gas have been estimated for this Alternative I-1 in the Central GOM.

b) Biotic Resources

Same as Alternative I-1 for the Eastern GOM, except that between 1150 and 2094 acres of habitat could be affected.

c) Human Resources

Same as Alternative I-1 for the Eastern GOM.

THE MORE SIGNIFICANT ENVIRONMENTAL CONSEQUENCES

Central Gulf of Mexico Resource Category	Level of Expected Impacts 1/ Scheduled Sales Only Under Alternative I-1	Cumulative Impacts of All Activities
1. General Impacts		
a. Coastal Ecosystems	moderate	moderate
b. Water Quality and Supply		
Water Quality	low to moderate	low
Water Supply	low to moderate	moderate
c. Navigation and Shipping	low	low
d. Other Uses of the OCS	high	high
e. Land Use	very low	moderate
f. Cultural Resources	moderate	high
2. Impacts of Special Concern		
a. Commercial Fisheries	moderate	moderate to high
b. Endangered Species	very low	low
c. Habitats and Resources of Special Concern	moderate	high
d. Air Quality	moderate	high
e. Recreation	low to moderate	moderate
f. Socioeconomic Factors	very low	low

1/ Definitions of levels of impact are located at the beginning of Section V.D.

(This table also applies to Alternatives I-2, II, III-1, III-2, and IV. See text.)

d) Land Resources

An irreversible and irretrievable commitment of land resources will result from the proposal but the use of sites where development exists can reduce or eliminate this commitment of resources. A complex and interrelated infrastructure has been developed over the past 30 years in the Central and Western Gulf, and much of the maximum acreage cited above will be obviated by use of these existing facilities, some of which are not operating at full capacity due to declining production over the past several years; or the facilities could be expanded to meet the additional requirements.

e) Economic Resources

Same as Alternative I-1 for the Eastern GOM.

f) Cultural Resources

Same as Alternative I-1 for the Eastern GOM.

b. Alternative I-2: The Proposed Schedule with Offerings of Favorable Geological Acreage

This option would retain the streamlining proposal but offer only the favorable geological acreage. The environmental impacts that would result from this proposal will be essentially the same as those described under Alternative I-1 since the bulk of the analysis for Alternative I-1 was based on the assumption that only development of areas with high resource potential would occur. However, under Alternative I-1 some development may occur outside the high resource potential areas. The impacts that would result from this development would not occur under Alternative I-2.

By limiting areal extent of possible leasing, subsequent environmental studies and analyses could concentrate on areas encompassing the favorable geological acreage. However, as occurs under the present schedule, some studies and analyses would extend beyond the high potential areas in order to examine all impacts that may result from the schedule.

Restricting leasing to favorable geological acreage also would have the advantage of reducing the area State and local governments have to consider when they plan for OCS activities.

c. Alternative II: The April 1981 Draft Schedule

Under Alternative II, in the Central Gulf, the impacts to resources will be similar to those described under Alternative I-1.

d. Alternative III-1: The Current Schedule, the Current System — No Action

The level of expected impacts following the implementation of Alternative III-1 in the Central Gulf does not significantly differ from those discussed in Alternative I-1.

Under Alternative III-1 the resource and infrastructure estimates were combined for the Central and Western Gulf, therefore, it was necessary to combine the Central and Western Gulf resource estimates under Alternative I-1 for comparative purposes. The estimated hydrocarbon resources for Alternative III-1 in the Central/Western Gulf are as follows: .39 billion barrels of oil and 5.17 trillion cubic feet of gas. Infrastructure expected to be used to explore and develop these resources include 411 exploratory wells and 72 platforms. The predicted oil resources and infrastructure for Alternative III-1 are approximately 31 percent less than those predicted for Alternative I-1 (Central/Western combined) estimates. It is expected that 1.0 oil spills greater than 1,000 bbl and .3 oil spills greater than 10,000 bbl (production plus transportation) will occur following the implementation of Alternative III-1.

Expected oil spills are about 15 percent more than that described for Alternative I-1. The predicted gas resources for Alternative III-1 are about 28 percent less than those predicted for Alternative I-1 (Central/Western combined). Although the resources are 31 and 28 percent less in Alternative III-1, significant differences in impacts cannot be differentiated from those described in Alternative I-1.

e. Alternative III-2: The Current Schedule with Larger Offerings

The hydrocarbon resources and infrastructure estimates for Alternatives III-1 and III-2 were combined for the Central and Western Gulf areas. Therefore, to compare these estimates with Alternative I-1, the Central and Western estimates for Alternative I-1 are combined for comparison purposes.

The estimated hydrocarbon resources for Alternative III-2 in the Central and Western Gulf are as follows: .46 billion barrels of oil and 6.13 trillion cubic feet of gas. Infrastructure expected to be used to explore and develop these resources include 482 exploratory wells and 85 platforms. The predicted oil resources for Alternative III-2 are approximately 18 percent less than those predicted for the combined Central and Western Gulf for Alternative I-1. Gas resources are about 15 percent less than Alternative I-1 estimates (Central/Western Gulf combined). It is expected that 1.2 oil spills greater than 1,000 bbl and .36 spills greater than 10,000 bbl will occur following the implementation of Alternative III-2.

Expected oil spills are about the same as those described for Alternative I-1 (Central/Western estimates combined). The predicted resources for Alternative III-2 are about 16 percent higher than those predicted for Alternative III-1. Although the resources, infrastructure, and oil spills are higher in Alternative III-2, significant differences in impacts cannot be differentiated from those described in Alternative III-1.

While the level of activity resulting from the adoption of this alternative is expected to be higher than that expected from III-1, the degree of difference is not expected to be enough to result in a decrease in impact levels to any resources of concern which could be considered significant enough to warrant an increase in any of the impact levels. Therefore, the level of expected impacts in the Central Gulf are not expected to differ from those diccussed in Alternative III-1.

f. Alternative IV-1.a: Delete 7 Alaska Sales, Change the Timing of Others Using Planning Area Wide Offerings

The impacts from this alternative in the Central Gulf are identical to those described for Alternative I-1.

g. Alternative IV-1.b: Delete 7 Alaska Sales, Change the Timing of Others Offering Favorable Geological Acreage

The impacts from this alternative in the Central Gulf are identical to those described for Alternative I-1.

h. Alternative IV-2.a: Delete All Arctic Planning Areas From the Schedule While Using Planning Area Wide Offerings

The impacts from this alternative in the Central Gulf are identical to those described for Alternative I-1.

i. Alternative IV-2.b: Delete All Arctic Planning Areas From the Schedule While Offering Favorable Geological Acreage

The impacts from this alternative in the Central Gulf are identical to those described for Alternative I-1.

6. Western Gulf of Mexico Planning Area

a. Alternative I-1 The Proposed Schedule with Planning Area Wide Offerings

The description of the proposal, Alternative I-1, is provided in Chapter III of this document. The data on estimated oil and gas resources, the statistically expected number of oil spills associated with the development of the resources, and the infrastructure required for resource development are discussed in the subsections below as appropriate for the individual resource categories.

1) General Impacts

a) Impacts on Coastal Ecosystems

Coastal ecosystems potentially affected by the proposed lease sales, regardless of the leasing schedule adopted, include saltmarsh, brackish marsh, fresh marsh, bays, lagoons, and estuaries. About 373 miles of coastline contain some 220 miles (59 percent) of coastal wetlands. The following counties bordering the Western Gulf contain coastal wetlands: Jefferson, Chambers, Galveston, Brazoria, Matagorda, Calhoun, Aransas, San Patricio, Nueces, Kleberg, Kenedy, Willacy, and Cameron. These wetlands perform such important biological functions as storm buffers for inland areas, detritus production, and nursery and feeding areas for many aquatic organisms, including valuable commercial and sport fish species.

Causes of impact stem from construction of pipelines and onshore facilities, or crude oil spills from exploration, production, transportation, or storage.

The effects of crude oil spills on coastal ecosystems have received considerable attention. Important variables include the amount and toxicity of the crude, the degree of weathering the crude has undergone prior to contacting a coastal ecosystem, the ecosystem type or types contaminated by the crude (i.e., marsh, beach, estuary, mangrove, etc.), the climate and weather of the spill site, the water depth and suspended sediment load, the cleanup method attempted, and previous exposure to oil spills. The above variables will determine the degree of damage and the recovery time for a particular coastal spill.

Oil reaching estuaries or marshes may have its most serious biological effects there. Because estuaries tend to act as nutrient traps, estuarine organisms can be exposed to long periods of

contamination. Since many of these organisms are living at or near the limit of their tolerance range, mortality could be high. *Spartina* spp. of the East and Gulf Coast salt marshes have been shown to withstand moderate single doses of hydrocarbons but continuous applications prove lethal because the oil kills the roots and rhizomes. All marsh plants species would probably be most affected by a spill during growing season, when the oil could influence flowering, vegetative reproduction, and seed development. In all coastal environments, oil spilled from onshore transportation or treatment activities may contaminate soil, vegetation, or shoreline. These spills may enter storm sewers and finally reach marine waters, where their deleterious effects have been previously described.

Trenching and burying pipeline nearshore and onshore up to the supratidal zone would disturb the seabottom and resuspend sediments. In marshes and estuaries, trenching or dredging may alter circulation patterns, tidal flow, and salinity gradients. Erosion of pipeline canals in marshes can cause significant losses of this habitat type.

The levels of impacts to coastal ecosystems depend on the magnitude of an individual oil spill and on the frequency of spills contacting these habitats. If a spill does contact coastal wetlands, losses of marsh vegetation, mangroves, and other biologically productive habitats will be high and may be relatively long-term. For the Western Gulf, the highest probability of an oil spill contacting land within 10 days, if a spill were to occur, is 35 percent; and the highest expected number of oil spills greater than 1,000 barrels as a result of this proposal is .4.

In the Western Gulf there will be two oil/gas pipeline landfalls. These landfalls will most probably occur in either or both Willacy or Matagorda counties. There are existing pipeline landfalls in these counties. Current regulations and authorities will ensure that the existing pipeline corridors will be used for future expansion.

Conclusion Severe and possibly long-term adverse impacts on coastal ecosystems will result if oil spills contact wetlands or if pipeline construction occurs in estuaries and marshes. The likelihood of such events is low, however. The overall levels of expected impacts will be moderate.

Cumulative Impacts In the event that all tracts offshore the Western Gulf are leased and developed during the life of the proposal, the expected number of oil spills greater than 1,000 bbl is .4 and the expected number of oil spills greater than 10,000 bbl is .1. Additionally, eight oil spills greater than 1,000 bbl and two oil spills greater than 10,000 bbl are expected to result from import tankering of crude oil. An unknown number of oil spills are expected to occur as a result of oil and gas activities in state-owned coastal areas. Although unlikely, the possibility exists that a relatively large oil spill contacting wetlands would be followed by another one in the same area. The cumulative effects of successive oil spills on coastal ecosystems are expected to be high and could be relatively long-term.

Several hundred miles of pipelines exist on the Federal OCS and in state-owned waters, and several additional pipelines will probably be constructed from existing leased tracts. This could cause adverse impacts on coastal ecosystems where pipelines would make landfall.

Vessel traffic will cause erosion of coastal waterways and will contribute to irreversible loss of coastal wetlands. Commercial fishing vessel traffic will have greater impact concerning marsh loss than does oil/gas related vessel traffic.

Natural subsidence, urbanization and construction projects, and the dredging and maintaining of coastal waterways contribute significantly to long-term cumulative impacts on coastal ecosystems.

Alternative I-1 contributes less than 10 percent of the oil spills greater than 1,000 bbl, less than 8 percent of the oil spills greater than 10,000 bbl; less than 20 percent of land use; and probably less than 20 percent of oil/gas vessel traffic, but does not contribute significantly to the other impact agents discussed above.

Although the non-OCS-related impact agents have a greater level of impact on coastal ecosystems, the contribution of Alternative I-1 to cumulative impacts on coastal ecosystems is moderate whether all resources offshore the Western Gulf are leased and developed or only the resources described for Alternative I-1 are developed.

b) Impacts on Water Quality and Supply

(1) Onshore Water Quality and Supply

General discussion of impact producing activities which might affect onshore water quality and supply is presented under the appropriate section above for the Eastern Gulf of Mexico.

We presently estimatedthat as many as two new gas processing plants might be constructed in the Western Gulf as a result of this proposed sale alternative. Projected population growth associated with the proposed action is not expected to significantly impact regional population growth trends, so no undue impact on water demand as a result of population growth is anticipated as a result of this proposed sale alternative. State and Federal water pollution control regulations will mitigate potential adverse impacts. Water supply requirements will be increased by only a small amount as a result of population increases; however, localized impacts on water supply may occur as a result of onshore facility siting. The extent of impacts on both water quality and supply will depend to some extent on specific facility locations.

Conclusion Onshore water pollution impacts are estimated to be low to moderate and localized as a result of the proposal.

Cumulative Impacts In the unlikely event that all tracts offshore the Western Gulf are leased and developed during the life of the proposal, several new gas processing plant are expected to be built. An unknown amount of growth in water requirements would result from an increase in employment. Both industrial and domestic water supply would have to be increased due to population increase. Offshore operations would require about 1 million gallons of fresh (non-potable) water for each well drilled.

OCS oil and gas related population increases and the attendent increase in water demands and water pollution are but a small percentage of the normal population increase and industrial growth of the area.

Since the non-OCS related impact agents have a greater level of impact on the onshore water quality and supply, the contribution of Alternative I-1 to cumulative impacts on these parameters are expected to be low to moderate whether all resources offshore the Western Gulf are leased and developed or only the resources described for Alternative I-1 are developed.

(2) Offshore Water Quality

General discussion of impact producing activities which might affect offshore water quality and supply is presented under the appropriate section above for the Eastern Gulf of Mexico.

For the Western Gulf, 622 wells would discharge a total of 59,600 barrels of drilling muds and 11,300 yds^3 of drill cuttings each day during drilling operations. During the production phase, these 622 wells would discharge from 622,000 to 927,000 barrels of formation water each day. The 36 platforms would discharge about 6,900 gallons of deck drainage and heating and cooling waters and 36,000 to 200,000 gallons of sanitary and domestic wastes each day.

Pipeline placement in a trench two to five yards wide and two yards below the seafloor would involve the disturbance of about 2,300 to 6,000 yds^3 of sediments per mile. In the Western Gulf, 150-250 miles of pipelines may be installed. This would disturb from 345,000 to 1,500,000 yds^3 of sediments. The plume of suspended sediments moves down-current; the distance varying with current speed, suspended particle load, and with water turbulence.

Conclusion The effect of sales included in the proposal will be moderate to severe degradation of water quality within a few meters or tens of meters of the discharge site at each platform rig. However, regional offshore water quality is not expected to be measurably degraded and impacts will be very low.

Cumulative Impacts In the unlikely event that all tracts offshore the Western Gulf are leased and developed during the life of the proposal, the expected number of oil spills greater than 1,000 bbl is .4 and the expected number of oil spills greater than 10,000 bbl is .1. Additionally, eight oil spills greater than 1,000 bbl and two oil spills greater than 10,000 bbl are expected to result from import tankering of crude oil. An unknown number of oil spills is expected to occur as a result of oil and gas activity in state-owned coastal areas.

About 11,769 exploratory/development wells, 320 platforms, and eight pipelines are estimated for this area with all Federal OCS resources developed. Currently, there are about 2,200 platforms on the Federal OCS and an unknown number of platforms in state waters. An unknown number of additional stuctures may be built as a result of resource development in state-owned coastal areas. Several hundred miles of pipelines exist in the Federal OCS and in state waters, and several additional pipelines will probably be constructed from existing leased tracts. Non-OCS-related vessel and tanker traffic will add pollutants to offshore waters probably to a greater degree than oil and gas activities from this alternative.

Alternative I-1 contributes less than 10 percent of the oil spills greater than 1,000 bbl, less than 8 percent of the oil spills greater than 10,000 bbl; less than 6 percent of the wells, and probably less than 20 percent of the oil/gas vessel traffic, but does not contribute significantly to the other impact agents discussed above. Since the non-OCS-related impact agents have a greater level of impacts on offshore water quality, the contribution of Alternative I-1 to cumulative impacts on the offshore water quality is very low, whether all resources offshore the Western Gulf are leased and developed or only the resources described for Alternative I-1 are developed.

c) Impacts on Shipping and Navigation

The major impacts to shipping and navigation that can be expected to occur as a result of OCS oil and gas activities would stem from the construction of offshore structures on the OCS during development and production phases. Navigation or operational errors in the vicinity of these structures may result in collisions. Impacts which result from any such collisions include injury, loss of life, spillage of oil, and release debris, including all or part of a rig, platform, or ship. The release of ship's cargo may present a serious threat to the environment if the cargo were a toxic chemical, crude oil, or refined oil product.

It is expected that during the first phase of oil and gas exploration there will be a slight negative impact on ship traffic which will be short term in nature, until traffic adjusts to new structure locations. Some conflicts may arise with vessel movements in the vicinity of major traffic areas. Additional numbers of industry service boats, barges, and drilling and mud ships will not be traveling in the customary traffic patterns of open water shipping. This expected increase of oil and gas related vessel traffic and their patterns of movement will increase the probability of collision in areas within/across existing lanes of vessel traffic.

During the exploration and production phase of oil and gas development, service vessels traveling between the coast and offshore sites during normal supply and work crew transport will result

in an increase in ship traffic in the area's harbors, traffic lanes, and offshore region. Slow-moving vessels engaged in trenching and pipe laying activities would also be operating in the area during the development phase. Pipeline construction operations, involve a lay barge, one to three tugboats, and several pipe supply vessels. Impacts would be limited to the time required to lay the pipeline, and prior knowledge of the precise location of pipeline laying operations at a given time would enable each vessel to avoid this ongoing work. Trips by service vessels will continue throughout all phases of OCS operations. However, as exploratory and development related activities decline, associated material transport and service trips will also decline. The remaining production related trips—worker transport, supply and service—will become routine. These trips will be primarily directed between onshore operations bases and offshore production areas. As a result of the Five-Year Schedule sales, vessel traffic in the Central Gulf will increase by 5%.

The OCS Lands Act authorizes the Coast Guard to promulgate and enforce marking requirements for rigs and platforms, and OCS Operating Order No. 1 requires identification marking of structures or abandoned subsea objects.

Due to the existing network of fairways in the Western Gulf, traffic coordination and regulation by the U.S. Coast Guard, and the issuance of permits for the erection of structures on the OCS by the Corps of Engineers, vessel to vessel collisions with OCS structures have been very few. Particularly, in consideration of over 80,000 ships crossing the Gulf waters each year, and the 2,500 structures existing on the OCS, the level of probability of a collision is very low. Presently, the probability of a vessel making a trip across the Western Gulf colliding with an OCS structure adjacent to a fairway is 1:89,000 (one accident in 89,000 vessel trips).

From 1963 to 1977, there were only 12 major collisions with OCS structures, eight of these occurred at night. Only one incident involved casualties. This was the Globtik Sun/Chevron Platform collision, where six tanker crewmen died. At least six of the accidents involved foreign flag vessels. The Hunt Oil Company's Platform "A", located at Eugene Island, Block 63, was involved in two accidents in a period of 16 months. This platform is located near an existing high traffic area, and illustrates the problem of exploration and production activities near shipping lanes.

While the number of offshore structures in the Gulf of Mexico has increased to over 2,500 in 1981, the number of accidents per structure vessel trip has decreased. The chances of a vessel with a draft over 18 feet colliding with a new platform constructed adjacent to a fairway as a result of all sales in the five-year schedule is 1:400,000 (one accident in 400,000 vessel trips).

Accident history in the Gulf shows that the 14 year average of vessel collisions with platforms is 0.9 accidents/year. It is assumed that only 5% of existing platforms will be near fairways, and thus, only 5% of future platforms installed will be adjacent to fairways. Also, assume that there are 80,000 trips across the Gulf/year by vessels with a draft of 19 feet or greater. (*Waterborne Commerce of the United States*, U.S. Army Corps of Engineers, Calendar Year, 1979). Therefore, with a 0.9 accident/year rate for 80,000 trips, the present probability is one accident in every 89,000 vessel trips. For the five-year schedule assume that of the 570 platforms to be installed, 5% or only 30 will be located near fairways in the Gulf. The accident probability of a vessel colliding with one of these 30 platforms is 1:400,000. The cumulative impact of the five-year schedule of sales and the existing platforms will increase the number of accidents by 22% to 1.1 accidents/year. Therefore, 1.1 accidents/year as a result of 80,000 trips yields a probability of one accident in every 73,000 vessel trips.

Conclusion The placement of structures on the OCS is presently regulated in all existing and proposed OCS operating areas, and navigation of OCS and non-OCS vessels is regulated seaward of major port areas. With proper enforcement of existing regulations and a continued use of the Gulf's network of established fairways, conflicts will be minimal as they have been in the past and overall impacts will be very low.

Cumulative Impacts In the unlikely event that all tracts offshore the Western Gulf are leased and developed during the life of the proposal, there will still be no significant conflicts with shipping and navigation.

During the life of the proposal, the expected number of oil spills is .4 spills greater than 1,000 bbl and .1 spill greater than 10,000 bbl. An additional eight oil spills greater than 1,000 bbl and two spills greater than 10,000 bbl are expected to result from import tankering of crude oil. An unknown number of oil spills could occur from development in state tidelands. A total of about 12 oil spills greater than 1,000 bbl are expected; however, it is unlikely that multiple spills would occur in the same area. The cumulative impacts of these oil spills on navigation and shipping is expected to be very low.

In all cases, the oil and gas related activities present a very small proportion of OCS traffic potentially interfering with shipping and navigation.

About 11,769 exploratory/development wells, 320 platforms, and eight pipelines are estimated for this area with all Federal OCS resources developed. Currently, there are about 2,200 platforms on the Federal OCS and an unknown number of platforms in state waters. An unknown number of additional structures may be built as a result of resouce development in state-owned coastal areas. Several hundred miles of pipelines exist in the Federal OCS and in state waters, and several additional pipelines will probably be constructed from existing leased tracts which could cause impacts and/or use conflicts, even though they would be of a very temporary and minor extent.

The proposed contributes less than 10 percent of oil spills greater than 1,000 bbl; less than 8 percent of oil spills greater than 10,000 bbl; less than 6 percent of the wells; less than 20 percent of land use; and less than 20 percent of the oil/gas vessel traffic.

Since the non-OCS-related impact agents have a greater level of impact on shipping and navigation, the contribution of Alternative I-1 to cumulative impacts on these parameters are expected to be very low, whether all resources the Western Gulf are leased and developed or only the resources described for Alternative I-1 are developed.

d) Impacts on Other Uses of the OCS

Potential impacts to commercial fishing and to recreational use of the OCS, as well as conflict with other management plans for the OCS, are discussed in Sections V.D.3.a.3) & 4).

(1) Military Uses:

One third or 11.8 million acres of the water and air space of the Western Gulf is used for various military operations. High density operations are conducted on a daily basis in some sectors-particularly offshore of Corpus Christi, Texas. In all warning areas the activities include the firing of live weapons; air-to-air and air-to-sea by aircraft, aircraft tests and operations, flight training, missile testing, and sonar buoy placement. Appropriate OPAREA manuals and instructions delineate the major areas and type of activity permitted within each. The military operating areas are also detailed in the U.S. Coast Pilot series and maps published by the National Ocean Survey (NOS). Weekly "Notice to Mariners" delineate the projected use of the areas.

Conclusion The potential for conflict between the military and oil and gas development is very high.

(2) Deepwater Ports:

OCS oil and gas activities resulting from the five-year leasing plan will not adversely impact deepwater ports established, approved, or proposed in the Gulf of Mexico. For the proposed Texas offshore oil port, fairways and anchorage areas have been approved. In accordance with Coast Guard and Corps of Engineers regulations, structures may not be erected within, but are restricted to areas adjacent to, these fairways, anchorages, and safety zones. Also pipelines must conform to crossing and burial specifications.

Conclusion Deepwater port activities are expected to have very low level of conflict with OCS oil/gas activities.

Cumulative Impacts In the unlikely event that all tracts offshore the Western Gulf are leased and developed during the life of the proposal, there will still be no significant conflicts with other uses of the OCS except military uses which is high.

During the life of the proposal, the expected number of oil spills are .4 spills greater than 1,000 bbl and .1 spill greater than 10,000 bbl. An additional eight oil spills greater than 1,000 bbl and two spills greater than 10,000 bbl are expected to result from import tankering of crude oil. An unknown number of oil spills could occur from development in State Tidelands. A total of about 12 oil spills greater than 1,000 bbl are expected; however, it is unlikely that multiple spills would occur in the same area. The cumulative impacts of these oil spills on using the OCS for military and deep water ports are expected to be low.

About 11,769 exploratory/development wells, 320 platforms, and eight pipelines are estimated for this area with all Federal OCS resources developed. Currently, there are about 2,200 platforms on the Federal OCS and an unknown number of platform in state waters. An unkown number of additional structures may be built as a result of resource development in state-owned coastal areas. Several hundred miles of pipelines exist in the Federal OCS and in state waters, and several additional pipelines will probably be constructed from existing leased tracts which could cause impacts and/or use conflicts, even though they would be of a very temporary and minor extent.

The proposal contributes less than 10 percent of oil spills greater than 1,000 bbl; less than 3 percent of oil spills greater than 10,000 bbl; less than 6 percent of the wells; less than 20 percent of land use; and less than 20 percent of oil/gas vessel traffic.

Since the non-OCS-related impact agents have a greater level of impact on the other users of the OCS, the contribution of Alternative I-1 to cumulative impacts on these parameters are expected to be high, whether all resources offshore the Western Gulf are leased and developed or only the resources described for Alternative I-1 are developed.

e) Impacts on Land Use

(1) Service or Support Bases

An estimated 3 new bases and the expansion of 20 existing ones requiring 131-299 acres have been assumed for Alternative I-1.

One platform fabrication yard is assumed for this proposal. At the present time there are four existing yards in Texas, four in Louisiana, and one proposed for Galveston. It is possible that all platform requirements could be constructed at plants in other parts of the country in lieu of actual site construction, either by increased production capacity or through yard expansion.

(2) Pipeline Landfalls

Two gas pipelines have been assumed and each would require approximately one acre. Another possibility is tying into the existing OCS infrastructure. Pipeine landfalls occur in several Texas coastal counties and the IPP has indicated that several coastal areas are acceptable for new pipelines.

(3) Gas Processing Plants

Two new gas processing plants along with the expansion of 12 existing ones in the Central and Westhern Gulf are assumed for Alternative I-1 utilizing an estimated 350-525 acres. There are approximately 60 plants located throughout the Texas coastal area, many of these have been operating at reduced capacity. It is possible that the unused capacity may fulfill the estimated plant requirements. Impacts resulting from siting of these plants are not expected to be significant due to mitigation through regulations and permitting requirements.

(4) Oil Refineries

It is assumed that 6 oil refineries will be expanded.

(5) Marine Terminals

It is assumed that 2 existing marine terminals will be expanded.

Conclusion Any impact which results from land usage for pipeline and facility sitings is expected to be very low due to mitigation through regulations and permitting requirements.

Cumulative Impacts In the unlikely event that all areas of the Western Gulf Federal OCS are leased and all resources are subsequently developed over the extent of the proposal the expected level of land use would be approximately 1,000 to 1,400 acres. An unknown amount of land could be used to support nearshore oil/gas development in state waters. Commerical and residential construction within coastal areas and expansion of existing ports will have a higher level of impact on land use than OCS-related impacts. The cumulative effect of these developments and ancillary activities is expected to result in a moderate level of impacts on land use in the Western Gulf area.

Since other, non-OCS-related impact agents have a greater impact on land use, the contribution of the proposal to cumulative impacts is very low whether all resources offshore the Western Gulf are leased and developed or only the resources described for Alternative I-1 are developed.

f) Impacts on Cultural Resources

For a general discussion of impacts, refer to the Eastern Gulf, Alternative I-1.

Under Alternative I-1, it is projected that 225 exploratory wells, and 437 development/production wells would be drilled, and 36 platforms would be placed, in the Western Gulf. It is also projected that, as a result of sales under Alternative I-1, approximately 889-1,232 acres would be disturbed by the construction of onshore support facilities. The number of oil spills resulting from Alternative I-1 for the Western Gulf is .4 .

Any bottom disturbing activity such as platform placement, anchoring, or pipeline trenching could damage or destroy historic and prehistoric cultural resources behined to be in the area. Due to the high expectations of the presence of historic shipments in the area, and the likelyhood of damage, impacts are expected to be moderate.

Conclusion Same as for Eastern Gulf, Alternative I-1. Overall level of impact is expected to be moderate.

Cumulative Impacts In the unlikely event that all tracts offshore the Western Gulf are leased and developed during the life of the proposal, the expected number of oil spills is .4 r spills greater than 1,000 bbl and .1 spill greater than 10,000 bbl. An additional eight oil spills greater than 1,000 bbl and two spills greater than 10,000 bbl are expected to result from import tankering of crude oil. An unknown number of oil spills could occur from development in State Tidelands.

A total of about 12 oil spills greater than 1,000 bbl are expected; however it is unlikely that multiple spills would occur in the same area. The cumulative impact of these oil spills on cultural resources is expected to cause a very high level of local impacts.

About 11,769 exploratory/development wells, 320 platforms, and eight pipelines are estimated for this area with all Federal OCS resources developed. Currently, there are about 2,200 platforms (Central/Western Gulf combined) on the Federal OCS and a unknown number of platforms in state waters. An unknown number of additional structures may occur as a result of resource development in State Tidelands. Several hundred miles of pipelines exist in the Federal OCS and state waters, and several additional pipelines will probably be constructed from existing leased tracts which could impact cultural resources.

Approximately 1,000 to 1,400 acres of land will be required with all Federal OCS resources developed. An unknown amount of land could be used to support oil/gas development in state waters. Commercial and residential construction and dredging within coastal areas also could impact cultural resources. The overall cumulative impact of this construction and ancillary activities is expected to result in a high level of impacts on cultural resources in this region.

The proposal contributes less than 10 percent of oil spills greater than 1,000 bbl; less than 8. percent of oil spills greater than 10,000 bbl; less than 6 percent of the wells, and less than 20 percent of land use. Since the non-OCS-related impacts probably have a greater impact on cultural resources, the contribution of the proposal to cumulative impacts is moderate whether all resources offshore the Western Gulf are leased and developed or only the resources described for Alternative I-1 are developed.

2) Impacts of Special Concern

a) Impacts on Commercial Fisheries

For a general discussion of Gulf of Mexico fish and shellfish landings, fishery biology, and the effects of oil and gas activities, see the discussion under Eastern Gulf of Mexico, V.D.4.a.(2).(a).

In the Western Gulf for Alternative I-1, the area foreclosed by platforms (120 platforms expected) as percent of fishing area is expected to be .002-.003 percent. This is considered to be an insignificant percentage of the total fishing area, and a low impact on fishing activity is expected. No ports are expected to become significantly crowded. A low impact is expected. The fishing area covered by the geologic area is estimated to be from 50-60 percent. There are about 1,022 platforms in the Western Gulf now and construction of approximately 36 more would not significantly contribute to gear conflicts, which are largely compensated through normal legal routes or through the Fishermen's Contingency Fund. The expected number of oil spills for Alternative I-1 for the Western Gulf is .4 ; the conditional probability is 0.07 percent that a spill will contact finfish or shellfish nursery grounds or shellfish harvest areas. There is the potential for a high impact on finfish or shellfish nursery grounds or shellfish harvest areas if they are contacted by an oil spill.

Although the expected number of spills is fairly low and the probability is very low, the potential is there for a high impact on commercial fishery resources should oil contact finfish and shellfish nursery grounds or shellfish harvest areas. In that event, there would be high, localized mortality of juvenile commercial finfish and shellfish, habitat destruction, and interference with the actual harvest of these species. Repeated contact of these areas by one or more spills would result in a more severe impact on commercial fishery resources. A large oil spill would adversely affect the commercial fishing industry due to loss of income if important fishing areas would have to be closed during the principal harvest seasons. These adverse impacts would be short term but would have the potential for serious localized economic losses.

Conclusion Moderate impact is expected on fishing activities. However, there could be a high impact on commercial fishery resources and on the commercial fishing industry should an oil spill contact major finfish or shellfish nursery grounds or major shellfish harvest areas. The likelihood of such an event occurring is low, however.

Cumulative Impacts In the unlikely event that all tracts offshore the Western Gulf are leased and developed during the life of the proposal, the expected number of oil spills greater than 1,000 barrels is .4 and the expected number of oil spills greater than 10,000 bbl is .1. Additionally, eight oil spills greater thant 1,000 bbl and two oil spills greater than 10,000 bbl are expected to result from import tankering of crude oil. An unknown number of oil spills are expected to occur as a result of oil and gas activities in state-owned coastal areas. Although unlikely, the possibility exists that a relatively large oil spill contacting estuarine nursery areas would be followed by another one in the same area. The cumulative effects of successive oil spills on estuarine nursery areas are expected to be moderate to high and could be relatively long-term.

320 platforms, 11,769 exploratory/development wells, and eight pipelines are estimated for this area with all Federal OCS resources developed. Currently, there are 2,200 platforms on the Federal OCS and an unknown number of platforms in state waters. Several hundred miles of pipelines exist in the Federal OCS and state-owned waters, and several additional pipelines will probably be constructed from existing leased tracts which could impact commercial fishing activities. An unknown number of additonal structures may be built as a result of resource development in state-owned coastal areas. The total fishing area that will be lost throughout the planning area from these structures will be very small.

Vessel traffic from existing and future oil and gas activities, gear conflicts, and crowding of ports associated with total development of oil and gas resources may create a moderate to high impact on the commercial fishing industry. The commercial fishery is also stressed for other reasons, such as fluctuations in fish populations, changes in market conditions, and restrictions on finfish and shellfish harvests. These other sources may cause moderate to high economic impacts on the industry. Overall, the expected regional impacts on commercial fisheries due to cumulative impacts from Alternative I-1 are moderate.

The proposal contributes less than 10 percent of the oil spills greater than 1,000 bbl; less than 8 percent of the oil spills greater than 10,000 bbl; less than 12 percent of the platforms; less than 20 percent of the land use; and perhaps 20 percent of the oil and gas vessel traffic, but does not contribute significantly to the other impact agents discussed above. Non-OCS-related impact agents have a sizable impact on the commercial fishery and the contribution of the proposal to cumulative impacts to these fisheries is moderate, whether all resources offshore the Western Gulf are leased and developed or only resources described for the alternative are developed.

b) Impacts on Endangered Species

In the Western Gulf, Alternative I-1 proposes two Gulf of Mexico and four Western Gulf sales. The potential production and transportation of oil resulting from this proposal could result in two oil spills with a 35 percent probability of contacting shore within 10 days. About 10-15 percent of the approximately 373 miles of shoreline in the Western Gulf is potential endangered species habitat and small sections (5-20 miles) of this habitat could be adversely affected by oil spills resulting in very low level impact on brown pelicans near Corpus Christi and along the southwest coast of Texas. Onshore facilities which may be constructed as a result of this proposal would require about 889-1,232 acres of land in developed coastal areas and are not expected to significantly affect endangered species habitat.

Conclusion In the Western Gulf, Alternative I-1 is expected to have a very low level impact on endangered species from oil spills, and no significant adverse effects on their populations or habitats are expected.

Cumulative Impacts In the unlikely event that all tracts offshore the Western Gulf are leased and developed during the life of the proposal, the expected number of oil spills is .4 spills greater than 1,000 bbl and .1 spill greater than 10,000 bbl. Approximately eight oil spills greater than 1,000 bbl are expected to result form import tankering of crude oil. An unknown number of oil spills could occur from development in state tidelands. A total of about 12 oil spills greater than 1,000 bbl are expected; however, it is unlikely that multiple spills would occur in the same area. The cumulative impact of these oil spills on endangered species is expected to cause a low level, short-term, local impact.

Vessel traffic from existing and future oil/gas activities may create very low impacts to endangered species. The use of ports and harbors associated with total development of oil/gas resources offshore the Western Gulf (federal and state) are not expected to be significantly different from the impacts described above for the proposal.

Endangered species are also stressed from other sources such as fluctuations in food resources and weather, pesticides, and loss of habitat. Overall the expected regional impacts on endangered species due to cumulative impacts is low.

Alternative I-1 contributes less than 10 percent of the oil spills greater than 1,000 bbl; less than 8 percent of the oil spills greater than 10,000 bbl; and approximately 15 percent of the oil/gas vessel traffic, but does not contribute significantly to the other impact agents discussed above.

Since the non-OCS-related impact agents have a greater level of impact on endangered species, the contribution of Alternative I-1 to cumulative impacts on these species is very low whether all resources offshore the Western Gulf are leased and developed or only the resources described for Alternative I-1 are developed.

c) Impacts on Habitats and Resources of Special Concern

In the region of the shelf break, the Western Gulf is characterized by a series of "topographic highs", geologic features rising out of 100-200 m to various depths and trending east-west along the break. Many of these are the surface expression of salt domes, and nearly all are hard, rocky outcrops. Many are drowned coral reefs. The hard, more or less vertical surfaces provide habitat and food for a wide variety of organisms, including corals, molluscs, crustaceans, sponges, crinoids, echinoderms, and algae; and it has been found, largely through BLM-funded studies, that, at similar depths, all of these banks contain similar biological communities. The East and West Flower Garden Banks off Texas rise closer to the water's surface than the others and are the only two which contain living hermatypic (reef-building) corals. These high value biotic communiteis would be moderately damaged if oil and gas operations were to take place right on them. The impacts would be due to two aspects of oil and gas operations: first, the drilling muds and cuttings will settle on and smother the benthic organisms within 100 m or so of the well site, and some constituents of the muds may be toxic to organisms within approximately 25 m of the discharge point. Second, such operations will cause destructive mechanical damage due to anchor, drilling itself, submersible and jack-up rig damage, and the installation of pipelines. While the area of such damage will be small, the areas of unique and productive biota are also small, and thus the damage to those ecosystems will be moderate, but avoidable if the biological stipulations are applied.

Stipulations have been developed to protect these valuable and unique biological resources from the impacts of oil and gas activities. It is believed that application of these restrictions, will reduce such potential impacts to an insignificant level.

There are several banks, particularly off the South Texas coast in the Western Gulf which have less relief and rise out of shallower water than those mentioned above, a[illegible] which are subjected to a much higher level of turbidity and sedimentation. These banks c[illegible]ly receive adequate protection by stipulations on existing leases prohibiting any activity w[illegible]e boundary of the bank itself (usually the deepest closing isobath of the bank).

Live bottom areas, including coral reefs, are biologically productive habitats in the Gulf of Mexico which are particularly sensitive to adverse effects from offshore oil and gas development. However, because of their discrete nature, they can be protected using mitigating measures which have been applied in the past. This region is considered to be moderately sensitive to oil spill effects upon bird populations and spawning and other fisheries habitats and resources.

Conclusion Oil and gas acitivities on these areas will cause severe and long-term damage to these unique and productive areas. Each well location will impact up to eight acres of benthic habitat. Impacts will be moderate.

Cumulative Impacts In the unlikely event that all tracts offshore the Western Gulf are leased and developed during the life of the proposal, the expected number of oil spills greater than 1,000 bbl is .4 and the expected number of oil spills greater than 10,000 bbls is .1. Additionally, eight oil spills greater than 1,000 bbl and two oil spills greater than 10,000 bbl are expected to result from import tankering of crude oil. An unknown number of oil spills are expected to occur as a result of oil and gas activities in state-owned coastal areas. About 11,769 exploratory/development wells, 320 platforms, and eight pipelines are estimated for this area if all Federal OCS resources are developed. Currently, there are 2,200 platforms on the Federal OCS and an unknown number in state waters. An unknown number of structures may be built as a result of resource development in state-owned coastal areas. Several hundred miles of pipelines exist on the Federal OCS and in state-owned waters, and several additional pipelines will probably be constructed from existing leased tracts. This could cause impacts on habitats and resources of special concern. Although unlikely, the possibility exists that a relatively large oil spill contacting estuaries would be followed by another one in the same area. The cumulative effects of succesive oil spills on coastal ecosystems and nursery areas are expected to be high and could be relatively long-term.

Furthermore, oil and gas well operations, successive well blowouts, spillage of drilling muds and cuttings, and the accidental introduction of toxic chemicals into waters close to hard bottom areas over the life of the proposal would cause relatively long-term and high cumulative impacts.

Vessel traffic in the estuaries will cause pollution and erosion of this habitat. Commercial fishing vessel traffic will have greater impacts on the estuaries than does oil/gas related vessel traffic.

Natural subsidence, urbanization and construction projects, and the dredging and maintaining of coastal waterways contribute significantly to long-term cumulative impacts on estuaries and nursery areas.

Alternative I-1 contributes less than 10 percent of the oil spills greater than 1,000 bbl; less than 8 percent of the oil spills greater than 10,000 bbl; less than 6 percent of the wells; and probably less than 20 percent of the oil/gas vessel traffic, but does not contribute significantly to the other impact agents discussed above.

Although the non-OCS-related impact agents have a greater level of impact on habitats and resources of special concern, the contribution of Alternative I-1 to cumulative impacts on habitats and resources of special concern is moderate, whether all resources offshore the Western Gulf are leased and developed or only the resources described for Alternative I-1 are developed.

d) Impacts on Air Quality

A discussion of the primary factors used in assessing onshore air quality impacts which may result from OCS-related activities and the method employed in quantifying the impact on this planning area are described in Section V.A.3 of this document.

Information on nonattainment areas in the planning area is provided in Table V.D.6.a.2)d)-1. Nonattainment Areas within the region.

Take V.D. 6. a.2)d)-1 Nonattainment Areas within the region

State	Area	Nonattainment Pollutants
Texas	Jefferson Co.	O_3
	Orange Co.	O_3
	Areas within AQCR 214, 216	0_3, TSP
	Areas within AQCR 213	TSP

It is estimated that 225 exploratory wells will be drilled to identify the resources and 437 development/production wells and 36 platforms to develop the resources under this alternative. It was assumed, for the purposes of analysis, that production from an average platform would be 0.1 million barrels of oil and 2.6 billion cubic feet of gas per year. The oil produced in the region is assumed to be transported by pipeline. Estimated representative emissions for exploration/development are provided in Table V.D.6.a.2(d)-2. This information is derived from Table V.A.3-1.

Table V.D.6.a.2).d).-2 Estimated Representative Emissions

Activity	Production at Platform (tons per year)				
	VOC	NO_x	TSP	SO_2	CO
Oil/gas	3	36	–	0.1	14
Barging	None	–	–	–	–

It is estimated that OCS facilities located within 20 miles of the coast would require emission controls. Some of the facilities (platforms) associated with the development of the resources under Alternative I-1 are anticipated to be sited within 20 miles of the shore; however, most will be sited beyond 20 miles of the coast. Two new gas processing plants are expected to be located in the region as a result of the adoption of Alternative I-1 (See Land Use, Section V.D.6.a. 1).e)) In addition, 12 existing plants in the Central and Western Gulf of Mexico planning areas are expected to be expanded.
A nigh qualitative impact is expected from routine emissions. Numerous gas processing plants are projected and much of the region is nonattainment for 0_3. Larger platforms close to shore could also impact the onshore area. If a blowout, oil spill, or fire were to occur at a platform near shore, short-term violations of several NAAQS could occur, depending on the type and duration of the accident.

Any emission sources which would adversely affect the onshore air quality would be subject to mitigation required by EPA and the state if located onshore, or by DOI, if located on the OCS. ERG (1981) discusses mitigation measures for OCS facilities.

Conclusion The level of impacts associated with the adoption of Alternative I-1 is moderate

Cumulative Impacts It is estimated that a total of 1.47 billion barrels of oil and 26.26 trillion cubic feet of gas exist in the entire Western Gulf Federal OCS planning area. In the event that total development of all federal reserves occurs over the life of this proposal, 320 new platforms with 11,769 wells would be required. It is very unlikely that this magnitude of development will occur over the life of this proposal.

The major influencing factors affecting the onshore air quality along the Western Gulf as a result of this development are: 1) the number of new wells drilled, 2) the timing of the activities, 3) the

location of the platforms and, 4) the instantaneous local meteorological conditions. The offshore development of this proposal contributes moderately to regional cumulative air quality and the onshore development, in the form of increased numbers of gas processing plants, contributes from moderately to very high to the regional and local cumulative air quality.

The increase in oil and gas development delineated in this proposal will occur as the entire Gulf of Mexico region grows in population as a result of unrelated industrial growth in the area. In most cases, oil and gas activities will be a very small part of this overall growth. The cumulative impact of this overall growth could increase ambient pollutant concentrations. Future economic growth in communities along the Gulf could be restricted by the increasing level of pollutants approaching federal and state air quality standards.

If all the proposed gas processing plants are installed, high regional and local cumulative air quality impacts would result. If the oil and gas produced as a result of this proposal replaces oil and gas presently being processed in onshore facilities (but coming from decreasing yield fields, platforms or imports) no cumulative impact to air quality would result; production levels at onshore facilities would remain stable with only the substitution of one source of raw product for another source.

Overall cumulative regional air quality impacts are expected to moderate to high; local impacts will range from moderate to very high. However EPA rules associated with the Clean Air Act and the DOI air quality rules have provisions to minimize these impacts.

e) Impacts on Recreation

Under Alternative I-1, .1 spills greater than 10,000 barrels are likely to occur in the Western Gulf. There is a moderate probability that this will severely impact a major shorefront recreational beach along the Texas coast (Padre Island National Seashore or Galveston Island, for example). Such a spill affecting a primary recreational beach will cause short-term pollution and disturbance to the resource base actually impacted and temporary loss and displacement of water related nearshore recreational activities. Some chronic trash and debris washup from offshore operations is likely to increase maintenance of beaches.

The addition of 36 platforms will enhance offshore recreational fishing opportunities for the next 20 to 30 years.

Conclusion Alternative I-1 is expected to enhance and increase offshore recreational fishing over the next 30 years by stimulating the development of 36 new offshore platforms (artificial reefs) which will attract fish and fishermen. Minor but chronic adverse impacts to shorefront recreational beaches is likely from trash washing ashore and intermittant construction activities. Projected oil spills will result in a moderate probability that some portion of the 373 miles of beach shoreline will be severely affected. Recreational areas directly impacted would suffer short term (up to 3 months) loss of recreational use. The impact would be low to moderate.

Cumulative Impacts In the unlikely event that all tracts offshore the Western Gulf are leased and developed during the life of the proposal, the expected number of oil spills is .4 spills greater than 1,000 bbl and .1 spill greater than 10,000. An additional eight oil spills greater than 1,000 bbl and two spills greater than 10,000 bbl are expected to result from tankering of imported crude oil. An unknown number of oil spills could occur from development in State Tidelands. A total of about 12 oil spills greater than 1,000 bbl are expected; however, it is unlikely that multiple spills would occur in the same area. The cumulative impact of these spills on recreation is expected to cause a moderate level of local impacts.

About 320 platforms and eight pipelines are estimated for this area with all Federal OCS resources developed. Currently, there are about 2,200 platforms on the Federal OCS and a un-

known number of platforms in state waters. An unknown number of additional structures may occur as a result of resource development in State Tidelands. Several hundred miles of pipelines exist in the Federal OCS and state waters, and several additional pipelines will probably be constructed from existing leased tracts which could impact recreation .

Approximately 1,000 to 1,400 acres of land will be required with all Federal OCS resources developed. An unknown amount of land could be used to support oil/gas development in state waters. Commerical and residential construction and dredging within coastal areas also could impact recreation. The overall cumulative impact of this construction and ancillary activities is expected to result in a moderate level of impacts on recreation in this region.

The proposal contributes less than 10 percent of oil spills greater than 1,000 bbl; less than 8 percent of oil spills greater than 10,000 bbl; less than 22 percent of the platforms and pipelines; and less than 20 percent of land use. Since the non-OCS-related impacts probably have a greater impact on recreation, the contribution of the proposal to cumulative impacts is low to moderate, whether all resources offshore the Western Gulf are leased and developed or only the resources described for Alternative I-1 are developed.

f) Socioeconomic Factors

The conditional mean estimates of resources recoverable from the Western Gulf region as a result of this proposed leasing schedule are .16 bbbls of oil and 2.80 tcf of natural gas. Based upon analysis from the Sales 67/69 FEIS, peak total employment due to the proposed schedule will be about 13,400 people. New resident employment and population in the peak year will be about 2,700 and 5,600 people, respectively.

Exploration activity in the Western Gulf region is expected to require up to 3 new shore bases and the expansion of 20 existing bases in Texas which probably will be located at Port Mansfield, Corpus Christi, Ingleside, Port O'Connor, Surfside, Freeport, Galveston, Pelican Island, or Aabine Pass. One addiational platform fabrication yard and two new gas processing plants,in addition to the expansion of 12 in the Western and Central Gulf, may also result. A more detailed analysis of these facilities is presented in the land use portion of this report.

The proposed schedule of sales may result in moderate to high negative impacts on tourism beaches in Texas as a result of related oil spills. The expected number of spills of 1,000 barrels or more will probably be about .4.

If such a spill should occur during the summer months, which represent the height of the Texas beach-related tourism season, the resultant economic losses may be high.

Also, negative impacts on port activity within this region due to OCS-related marine traffic should be successfully minimized by existing federal, state, and local jurisdictional authorities and regulations. The Western Gulf region recorded over 287,000 vessel trips to and from major ports in 1979, according to U.S. Army Corps of Engineers data. Major waterway user conflicts were effectively prevented or resolved by the appropriate authorities. Furthermore, over 468,000 vessel trips were recorded to and from Central Gulf major ports with no major unresolved waterway user conflicts. Thus, no additional problems in the Western Gulf regarding port activity are anticipated as a result of the proposed five year schedule.

Conclusion New resident population and employment growth in the Western Gulf due to the proposed schedule is not expected to create major infrastructure stresses. The negative impacts on tourism along the Texas Gulf coast as a result of an expected major oil spill associated with the proposed schedule will be moderate. Also, adverse impacts on port activity will be negligible. The overall level of impact is expected to be very low.

Cumulative Impacts In the unlikely event that all tracts offshore the Western Gulf are leased and developed during the life of the proposal, the expected number of oil spills is .4 spills greater

than 1,000 bbl . 1 one spill greater than 10,000 bbl. An additional eight oil spills greater than 1,000 bbl and two spills greater than 10,000 bbl are expected to result from tankering of imported crude oil. An unknown number of oil spills could occur from development in State Tidelands. A total of about 12 oil spills greater than 1,000 bbl are expected; however, it is unlikely that multiple spills would occur in the same area. The cumulative impact of these spills on socioeconomic factors is expected to cause a low level of local impacts.

Approximately 1,000 to 1,400 acres of land will be required with all Federal OCS resources developed. An unknown amount of land could be used to support oil/gas development in state waters. Commerical and residential construction within coastal areas also could impact socioeconomic factors. The overall cumulative impact of this construction and ancillary activities is expected to result in a low level of impacts on socioeconomic factors.

The proposal contributes less than 17 percent of oil spills greater than 1,000 bbl; less than 20 percent of oil spills greater than 10,000 bbl; and less than 20 percent of land use. Since the non-OCS-related impacts probably have a greater impact on socioeconomic factors, the contribution of the proposal to cumulative impacts is very low whether all resources offshore the Western Gulf are leased and developed or only the resources described for Alternative I-1 are developed.

3) Impacts of Other Management Plans

a) Marine Sanctuaries

There are no national marine sanctuaries in the Western Gulf of Mexico at the present time, although one at the East and West Flower Garden Bank (about 120 nmi south of Galveston) has been proposed for nearly three years. It is uncertain at the present time whether or not such a sanctuary will ever be designated. In any event, the Department of Interior has agreed to apply certain restrictions to oil and gas operations by means of lease stipulations to tracts within the proposed sanctuary. These stipulations are discussed and described in Section IV.B.3.c.

b) Coastal Zone Managment

The state of Texas has withdrawn from the federal CZM program; however, they have opted for their own program of coastal control and any facility sitings must be consistent with and meet the objectives of their plan.

4) Unavoidable Adverse Impacts

a) Marine Habitats and Resources

In the Western Gulf minor decreases in primary productivity due to the mortality or functional impairment of plankton, benthic organisms, seagrasses, and algae will occur in localized areas of high turbidities generated by drilling fluids disposal and bottom sediments suspended by pipeline laying and burying operations. The possibility exists that toxic materials used in mud mixtures may adversely affect some marine organisms in localized areas when the drilling fluids and cuttings are discharged; such effects will be short-lived.

Disruption will occur if fresh oil spills reach shallow sensitive biological features. Localized severe, selective mortalities and functional impairment would probably occur, thereby altering the community structure for an unknown, but brief, period of time.

Adverse impacts could occur to endangered and threatened species of marine mammals and birds. The most serious potential impacts would occur from major oil spills and chronic oil pollution.

b) Commercial Fisheries

Of the various types of fishing gear in use in the OCS areas, towed bottom gear, such as trawls and dredges, as well as pots, have the greatest chance for operational conflicts with oil and gas activities. These conflicts are unavoidable in all OCS areas, as these fishing methods are common to all areas. However, losses can be compensated. Trawling operations suffer interference and inconvenience from oil and gas operations in several ways. Trawl nets can become snagged on underwater stubs, causing damage or loss of the nets. Pots can also be lost in this manner. In addition, it is conceivable that snags could damage underwater production equipment or pipelines, causing a spill of oil and gas. Because safety equipment is installed which shuts in production when a loss of pressure occurs, the likelihood of a major spill resulting thereby is considered very small. Less frequently, large objects which were lost overboard from petroleum industry boats, pipeline lay barges and platforms are caught by fishing gear, resulting in damage to the gear and/or its catch of fish; however, frequency of occurrence of this type of incident is low.

Commercial fishermen would probably not harvest fish in the area of an oil spill, as spilled oil could coat or contaminate commercial fish species, rendering them unmarketable. This would be another adverse effect to commercial fishing.

c) Coastal Habitats and Resources

For the Western Gulf planning area, the highest probability of an oil spill contacting land within 10 days, if one were to occur, is 35%.

If an oil spill does contact coastal wetlands, adverse environmental impacts will be high. The entire coastline of this planning area, some 373 miles, can be affected by oil spills. Approximately 220 miles, or 59% of this coastline consist of coastal wetlands and are therefore susceptible to high adverse environmental impacts if oil contacts this habitat.

Beaches, barrier islands, wetlands, and other coastal ecosystems are located throughout the areas encompassed by the proposed sales. If any of these coastal areas are contaminated by oil, an undetermined amount of fish and wildlife habitat (primarily birds) will be damaged. It is possible that a large number of deaths, particularly to birds, fish larvae, and shellfish, would occur should a large spill reach shore.

The unavoidable short-term impacts associated with trenching and backfilling for pipeline construction include the uprooting of all plants and nonmotile animals in the path of the pipeline, thereby leaving a barren strip 9 to 12 meters wide. Some unavoidable damage may also be rendered to vegetation in adjacent areas by machinery used in the operation. The long-term impacts could include saltwater intrusion, changes in floral and faunal components and a possible increase in marsh erosion if a canal is not backfilled.

In the event of an onshore oil pipeline leak or spillage at onshore facilities, it is inevitable the vegetation would be affected to an extent that would be dependent upon the severity of the spill. While a small leak may do little damage, a severe leak may contaminate the substrate and kill the vegetation that comes into direct contact with oil and several years may be required for recovery. Small animals in contact with the oil would probably be killed.

d) Socioeconomic Systems

The unavoidable adverse impacts in the Western Gulf associated with the proposed schedule will be generally the same as those discussed under Alternative I-1 for the Eastern Gulf region.

e) Recreation

The adverse impacts on recreation that could be encountered if the proposed sale proceed are: the temporary disruption of recreational areas caused by

pipeline burial, the competition for land between recreation and OCS-related onshore facilities, the degradation of the aesthetic environment conducive to recreation, and the damage to recreational sites caused by an oil spill. The first three impacts could largely be mitigated through careful site selection and by timing the construction of OCS facilities for the nonpeak season. When an oil spill occurs, the extent of the recreation impact is dependent upon the location and size of the spill, the time of year in which the spill occurs, and the degree of success of cleanup.

A major spill would largely preclude any recreational activity in the affected area. Should oil impact a beach, the recreational use of that beach will be eliminated or dislocated until cleanup procedures have been completed and the beach restored to a desirable, usable state. The use which the impacted beach would normally receive could be temporarily transferred to surrounding beaches (if available), which might cause crowding and ultimate denial of beach areas to some people. Oil spills could temporarily close marinas and boat launching facilities. This would deny some boaters the opportunity to participate in the activity. The spill could result in bird mortality which could affect hunting activities.

f) Air Quality

Unavoidable adverse impacts in the Western Gulf of Mexico resulting from the proposal are assumed to be similar, if not identical, to those discussed for the Eastern Gulf in Section V.D.4.a.4.

g) Shipping and Navigation

A certain amount of interference between offshore structures and vessel traffic will occur as a result of the proposed sales. This could lead to an increase in accidents involving OCS vessels and structures. However, because shipping will use the existing network of fairways, the probability of an accident per trip is very low.

Very little navigational interference can be expected between ships utilizing established fairways. Coast Guard regulations regarding structure safety lights and horns, and ship safety regulations are important factors, also, in minimizing conflicts and preventing accidents between structures and vessels on the OCS. However, at night, in rough water, and in fog the potential for all accidents increases.

h) Water Quality

Normal offshore operations would have unavoidable effects of varying degrees on the quality of the surrounding water if the proposed sales are implemented. Drilling, construction, and pipelaying would cause an increase in the turbidity on the affected waters for the duration of the activity periods, and, in the case of pipelines, could disturb settled pollutants. A turbidity plume, several hundred yards in length, could also be created by the discharge of drill cuttings and the adherent drilling fluids. This, however, would only affect waters in the immediate vicinity of the rigs. The discharge of treated sewage from the rigs and platforms would increase the levels of suspended solids, nutrients, chlorine, and BOD in a small area near the discharge points. Chronic spills from platforms and the discharge of formation waters will result in increase of the hydrocarbon levels and possibly trace metal concentrations in the water column. Overall, the effect will be the degradation of water quality around platforms.

In the case of an accidental spill, unavoidable deleterious effects to offshore water quality would result. Spilled oil that is not recovered would release hydrocarbons and trace metals into the environment. The quality of the surface, near surface, and to a lesser extent, deeper waters would therefore be lowered for the duration of the spill. If oil is entrapped in bottom or shoreline sediments this degradation would continue over weeks or months while the oil was slowly reintroduced into the system.

Unavoidable impacts to onshore water quality will also occur caused by runoff from construction and sewage from the increases in population resulting from OCS activities.

i) Cultural Resources

There is a small possibility that unknown archaeological and/or historic artifacts and sites exist within the proposed lease sale areas. Cultural resource surveys may not detect with certainty all such sites or artifacts. Those materials within undetected sites could be damaged or destroyed by subsequent oil and gas activity such as structure siting and anchoring.

Other damage to archaeological resources could come from oil contamination. Historical and archaeological materials soiled by an accidental oil spill may not survive subsequent cleaning and restoration efforts.

The probability of such a polluting event occurring and interacting with artifacts is considered low and the potential for significant resource destruction appears small.

5) Relationship Between Short-Term Uses of Man's Environment and the Maintenance and Enhancement of Long-Term Productivity

The principal short-term use of the leased areas in the Western Gulf under the proposed schedule would be for the production of .16 bbbl of oil and 2.80 tcf of natural gas. This activity would temporarily interfere with tourism in the region in the event of a major oil spill (1,000 barrels or more) contacting popular tourist beaches. The expected number of spills within a 30-day period after an oil mishap is 1.0. The expected economic impact based on such an occurrence estimate is moderate.

Also, other short- and long-term impacts in the Western Gulf associated with the proposed schedule are generally the same as those discussed under Alternative I-1 for the Eastern Gulf region.

6) Irreversible and Irretrievable Committment of Resources

a) Mineral Resources

Same as Alternative I-1 for the Eastern Gulf of Mexico, except that .16 bbbl of oil and 2.80 tcf of gas have been estimated for this Alternative (I-1) in the Western Gulf of Mexico.

b) Biotic Resources

Same as Alternative I-1 for the Eastern Gulf of Mexico, except that between 889-1,232 acres of habitat could be affected.

c) Human Resources

Same as Alternative I-1 for the Eastern Gulf of Mexico.

d) Land Resources

Same as Alternative I-1 for the Eastern Gulf of Mexico.

e) Economic Resources

Same as Alternative I-1 for the Eastern Gulf of Mexico.

f) Cultural Resources

Same as Alternative I-1 for the Eastern Gulf of Mexico.

b. Alternative I-2: The Proposed Schedule with Offerings of Favorable Geological Acreage

This option would retain the streamlining proposal but offer only the favorable geological acreage. The environmental impacts that would result from this proposal will be essentially the same as those described under Alternative I-1 since the bulk of the analysis for

THE MORE SIGNIFICANT ENVIRONMENTAL CONSEQUENCES

Western Gulf of Mexico Resources Category	Level of Expected Impacts1/ Scheduled Sales Only Under Alternative I-1	Cumulative Impacts of All Activities
1. General Impacts		
a. Coastal Ecosystems	moderate	moderate
b. Water Quality and Supply		
Water Quality	low to moderate	low to moderate
Water Supply	low to moderate	low to moderate
c. Navigation and Shipping	very low	low
d. Other Uses of the OCS	high	high
e. Land Use	very low	moderate
f. Cultural Resources	moderate	high
2. Impacts of Special Concern		
a. Commercial Fisheries	moderate	moderate
b. Endangered Species	very low	low
c. Habitats and Resources of Special Concern	moderate	high
d. Air Quality	moderate	high
e. Recreation	low to moderate	moderate
f. Socioeconomic Factors	very low	low

1/ Definitions of levels of impact are located at the beginning of Section V.D.

(This table also applies to Alternatives I-2, II, III-1, III-2, and IV. See text.)

Alternative I-1 was based on the assumption that only development of areas with high resource potential would occur. However, under Alternative I-1 some development may occur outside the high resource potential areas. The impacts that would result from this development would not occur under Alternative I-2.

By limiting areal extent of possible leasing, subsequent environmental studies and analyses could concentrate on areas encompassing the favorable geological acreage. However, as occurs under the present schedule, some studies and analyses would extend beyond the high potential areas in order to examine all impacts that may result from the schedule.

Restricting leasing to the favorable geological acreage also would have the advantage of reducing the area State and local governments have to consider when they plan for OCS activities.

c. Alternative II: The April 1981 Draft Schedule

Under Alternative II, in the Western Gulf, the expected level of impacts to resources will be the same as described under Alternative I-1.

d. Alternative III-1: The Current Schedule, the Current System – No Action

The level of expected impacts following the implementation of Alternative III-1 in the Western Gulf does not significantly differ from those discussed in Alternative I-1.

Under Alternative III-1 the resource and infrastructure estimates were combined for the Central and Western Gulf; therefore, it was necessary to combine the Central and Western Gulf resource estimates under Alternative I-1 for comparative purposes. The estimated hydrocarbon resources for Alternative III-1 in the Central/Western Gulf are as follows: .39 billion barrels of oil and 5.17 trillion cubic feet of gas. Infrastructure expected to be used to explore and develop these resources include 411 exploratory wells and 72 platforms. The predicted oil resources and infrastructure for Alternative III-1 are approximately 31 percent less than those predicted for Alternative I-1 estimates. It is expected that 1.0 oil spills greater than 1,000 bbl and .3 oil spill greater than 10,000 bbl (production plus transportation) will occur following the implementation of Alternative III-1.

Expected oil spills are about 33 percent less than that described for Alternative I-1. The predicted gas resources for Alternative III-1 are about 28 percent less than those predicted for Alternative I-1 (Central/Western combined). Although the oil resources and infrastructure are 23 percent less in Alternative III-1, significant differences in impacts cannot be differentiated from those described in Alternative I-1.

e. Alternative III-2: The Current Schedule with Larger Offerings

The hydrocarbon resources and infrastructure estimates for Alternatives III-1 and III-2 were combined for the Central and Western Gulf areas. Therefore, to compare these estimates with Alternative I-1, the Central and Western estimates for Alternative I-1 are combined for comparison purposes.

The estimated hydrocarbon resources for Alternative III-2 in the Central and Western Gulf are as follows: .46 billion barrels of oil and 6.13 trillion cubic feet of gas. Infrastructure expected to be used to explore and develop these resources include 482 exploratory wells and 85 platforms. The predicted oil resources and infrastructure for Alternative III-2 are approximately

18. percent less than those predicted for the combined Central and Western Gulf for Alternative I-1. Gas resources are about 15 percent less than Alternative I-1 estimates (Central/Western Gulf combined). It is expected that 1.2 oil spills greater than 1,000 bbl and .4 spills greater than 10,000 bbl will occur following the implementation of Alternative III-2.

Expected oil spills are about the same as those described for Alternative I-1 (Central/Western estimates combined). The predicted resources for Alternative III-2 are about 16 percent lower than those predicted for Alternative III-1. Although the resources, infrastructure, and oil spills are higher in Alternative III-2, significant differences in impacts cannot be differentiated from those described in Alternative III-1.

While the level of activity resulting from the adoption of this alternative is expected tobe higherthan that expected from III-1, the degree of difference is not expected to be enough to result in a decrease in impact levels to any resources of concern which could be considered significant enough to warrant a decrease in any of the impact levels. Therefore, the level of expected impacts in this alternative are not expected to differ from those diccussed in Alternative III-1.

f. Alternative IV-1.a: Delete 7 Alaska Sales, Change the Timing of Others Using Planning Area Wide Offerings

The impacts from this alternative in the Western Gulf are identical to those described for Alternative I-1.

g. Alternative IV-1.b: Delete 7 Alaska Sales, Change the Timing of Others Offering Favorable Geological Acreage

The impacts from this alternative in the Western Gulf are identical to those described for Alternative I-1.

h. Alternative IV-2.a: Delete All Arctic Planning Areas From the Schedule While Using Planning Area Wide Offerings

The impacts from this alternative in the Western Gulf are identical to those described for Alternative I-1.

i. Alternative IV-2.b: Delete All Arctic Planning Areas From the Schedule While Offering Favorable Geological Acreage

The impacts from this alternative in the Western Gulf are identical to those described for Alternative I-1.

7. Southern California

a. Alternative I-1: The Proposed Schedule with Planning Area-wide Offerings

The description of the proposal, Alternative I-1, is provided in Chapter III of this document. The data on estimated oil and gas resources, the statistically expected number of oil spills associated with the development of the resources, and the infrastructure required for resource development are reiterated in the subsections below as appropriate for the individual resource categories.

The analysis of impacts associated with the adoption of Alternative I-1 is principally based upon the assumption that only areas with favorable geologic characteristics (most favorable areas or most likely areas) will be leased and subsequently developed. The impacts related to Alternatives I-1 and I-2 are therefore essentially identical. There is however a possibility that resource development could occur outside the most likely areas if the area-wide leasing approach (Alternative I-1) is adopted since oil companies may choose to bid on these areas. Such development is expected to be the exception rather than the rule and is not expected to result in impacts significantly different from those described in this section. Definitions of terms used to describe level of impact (very high to very low) are provided at the begining of Section V.D.

1) General Impacts

a) Water Quality and Supply

(1) Water Quality: Water quality in the Southern California OCS will be subject to impact from oil and gas exploration and development activities. Water quality is currently degraded to varying degrees depending on proximity to nearshore municipal sewage discharges, sewer runoff, and pollutants trapped in eddies/depositional sites. The most pristine waters occur on the outer banks and basins (e.g., Tanner-Cortes Banks) and windward sides of Channel Islands.

The analyses of impact which follow must be considered in relation to two factors. First is the horizontal advective transport which occurs in the area and second is the focus of concern of water quality measurements. Horizontal advective transport in the California Current which dominates the oceanic flow past much of California for a part of the year is estimated to be 10-12 x 10^6 m^3/sec (Sverdrup, Johnson, and Fleming, 1942). Assuming one-tenth to one-fifth of this flow occurs over the OCS, a considerable volume of water moves past any point along the coast where OCS activities may occur. In light of this flow, it is not surprising that open ocean water quality rarely shows the effects of pollutants in terms of water column measurements of dissolved substances. If, for example, all the formation water expected from a typical production well in the Southern California OCS (about 7 x 10^5 barrels) were to be discharged within one second and eventually mixed through the water column (assuming 1 x $10^5 m^3$/sec flows past the area a platform could influence), then the formation water would be diluted to about one-tenth its initial concentration (7 x 10^5 barrels = about 1.33 x

10^4 m^3). Nickel, a contaminant trace metal in many formation waters, would be diluted to the 10-30 parts per trillion range and most other trace metals much below this range. The preceeding analysis for dilution potential in the Southern California area represents a minimum dilution scenario using unrealistic assumptions. Real dilution would occur at a much greater rate because discharge would be at a lower rate, into a very much larger water mass over more time (years) but mixing would probably be more restricted in the vertical direction depending on depth of discharge of formation water. The dilution analysis as a basis for estimating water quality has limitations because of unknown transport rates of water masses in detail in small areas such as the Santa Barbara Channel and in OCS areas with complex bottom topography. The Southern California region contains submarine basins where water mass residence times may be on the order of 1 year and transport and subsequent dilution of pollutants finding their way into these basins may be much more restricted than the upper water columns. Impacts to water quality in these basins (e.g., Santa Barbara, Santa Monica, Santa Cruz, San Nicolas Basins) would be greater than predicted by dilution analyses above.

The second factor to be considered in the water quality impact analysis is the focus of concern behind water quality measurements. It is generally not water quality per se which is of concern, but the effects on marine and human ecosystems which are exposed directly or indirectly to the environmental conditions imposed by the surrounding water mass. It is rare that pollutants degrade water quality to such a degree that the water in the OCS becomes unsuitable for the uses that man and marine organisms make of it. Water masses tend to return to pristine conditions first through dilution and then through physical and chemical processes generally operating on rather short time scales of days or weeks (dilution, particle deposition, hydrocarbon degradation in the water column, and chemical precipitation of metals, etc.). However, the organisms exposed to the water mass may "see" the diluted pollutants over long periods and, therefore, simple dilution analyses do not necessarily reflect water quality impacts to the factors of real concern such as marine food chains and human consumption of marine organisms. These long-term impacts to marine species and ecosystems are generally unknown although some data are available for some organisms and pollutants. Short-term or acute toxicity data are available for a wide range of substances and organisms. Long-term estimated impacts to marine organisms and ecosystems, short-term impacts, estimated dilution, and physical and chemical processes are all considered in the impact analyses and the water quality impacts discussed below.

Water quality may be affected by a variety of agents associated with OCS oil and gas activities in Southern California. The agents are: petroleum hydrocarbons, drilling fluids (muds and cuttings), formation water, domestic sewage, and resuspended sediments.

Petroleum hydrocarbons may be spilled accidentally in large volumes from platform blowouts or small volumes from routine operations of loading and offloading crude oil. Water quality may be degraded in either instance due to toxic hydrocarbons introduced into the marine environment. These hydrocarbons may be transported to benthic sediments, entrained and subsequently released back into the water column over time or they may be taken up by a variety of marine organisms from the water and/or sediments. Hydrocarbons

within organisms may have several fates and effects (see USDOI, 1980d, Appendix 8). Hydrocarbons may reduce oxygen content of enclosed bodies of water (e.g., estuaries) through chemical oxygen demand leading to suffocation of marine organisms. The proposal (Alternative I-1) calls for three sales in Southern California with the statistical expectation of 3.3 spills greater than 1,000 barrels and 1.5 spills greater than 10,000 barrels. The impact on water quality and marine life of these spills is highly dependent upon timing and location. Nearshore areas such as estuaries could experience very high water quality degradation if a spill occurred on a flood tide and was carried into the estuary. If the estuary were shallow, oil could be trapped in sediments with consequent long-term release of hydrocarbons back into the water during tidal cycles. Marine biota would be very highly affected by a spill in these circumstances (see Section V.D.7.a.2)a)(3)). If the statistically expected spills occur under open ocean conditions with high waves, and spills are distributed more or less evenly during the expected OCS development period (up to several decades) in the region, then the impacts on water quality would be very low (water quality degraded only near the point of discharge and only lasting for several days).

Spills are random events and their timing and volume cannot be predicted with any significant degree of accuracy. The above discussion represents the extremes of impact. Short-term local impacts from spills are usually greater than long time impacts to large areas such as the Southern California Bight given equal volumes of spilled oil. Considering the above discussion, the overall level of impact to water quality from spilled oil is low although the likelihood (based on statistically expected spills) is high.

Drilling fluids are routinely discharged into the marine environment under NPDES permits. The cuttings from exploration and development wells fall rapidly to the bottom within a few meters of a platform changing sediment characteristics for periods lasting up to several years depending upon the dynamic oceanographic forces characteristic of the area (ECOMAR, 1978; Lake Buena Vista Symposium, 1980). Drilling muds are deposited at greater distances from the point of discharge (USDOI, 1980d, Appendix 8; Lake Buena Vista Symposium, 1980). Muds and cuttings may cause changes in benthic sediments eliminating and/or replacing of the original benthic fauna. The muds may also act to smother some sensitive sessile marine animals or produce localized turbidity within the water column reducing light penetration and, therefore, photosynthesis by phytoplankton. Evidence (USDOI, 1980d; Lake Buena Vista Symposium, 1980; Petrazullo, 1981; Dames and Moore, 1980) indicates very little direct toxic action of muds or cuttings with the exception of some muds contaminated with trace metals such as mercury.

The level of impact from muds and cuttings is in relation to the expected volumes discharged and the proximity of sensitive habitats. The volume of cuttings expected to result from this proposed schedule is 3.68×10^5 cu. yds. and the volume of mud expected to be discharged is 3.39×10^6 barrels. This volume is approximately equal to the volume of sediments entering the eastern end of the Santa Barbara Channel (6.36×10^6 barrels, Civil Engineering L aboratory at Point Hueneme) and may be significant to sedimentary processes in the region. The contributions to sedimentary processes from muds and cuttings in the Southern California region will be spread over an area larger than just the Santa Barbara Channel diluting the

effects and reducing the significant impacts to the natural processes. This is balanced by the tendency of muds and cuttings to settle near the rig and platform discharge points creating a more significant impact locally around these structures. Overall, the impacts from muds and cuttings are expected to be moderate (near platform/rig sediment changes are moderate and regionwide impacts low due to dilution over time and space). The likelihood of drilling fluid impacts is high.

Formation water is discharged into the ocean from offshore platform and onshore separation facilities or reinjected into the geologic structure to enhance oil recovery. Both practices have existed in the Southern California region and, if the former is practiced, a total of 7.91×10^8 barrels of water will be discharged. Water quality would be degraded where the discharges occur due to hydrocarbons and trace metals in the formation water. Some salinity and temperature effects from discharged water could also be noticed near the discharges. Few data exist regarding the effects of formation water on marine organisms but the effects may be deduced from related hydrocarbon and trace metal toxicity data. These data indicate (see USDOI, 1980d, Appendix 8; USDOI, 1980f) that the dilution of formation water by ambient sea water would reduce trace metal concentrations in the discharged formation water below EPA recommended safe levels within 0.5 km of the discharge point. Only mercury and cadmium among the trace metals in typical California formation water approach the EPA 24-hour criteria levels. Toxic effects of trace metals are discussed in Appendix 8 of the FEIS Proposed 5-Year OCS Oil and Gas Lease Sale Schedule (USDOI, 1980d) and FEIS for OCS Sale No. 53 (USDOI, 1980a) and Sale No. 68 (USDOI, 1981a). The impacts to water quality from formation water are likely given current practices in the Southern California OCS but these practices may also be changed to mitigate impacts. The expected level of impact to water quality is considered low for the region in general but would be moderate (significant increases in trace metal and/or dissolved hydrocarbons in the water column) in areas of pristine water such as offshore islands or Tanner-Cortes Banks.

Domestic sewage, kitchen and bathroom waste water, are discharged routinely from oil and gas platforms into the ocean after treatment. These wastes may trigger very localized eutrophic conditions due to supplemental nutrients (nitrate). Some residual chlorine may be present in discharged wastes after treatment (regulated by NPDES permit) but this is quickly diluted, evaporated, and converted to other chemical forms in the ocean. The amount of sewage expected from the OCS activity associated with the proposed schedule is estimated to be 103,600 gallons per day from 37 platforms in the Southern California region. The likelihood of impacts from sewage is high (routine discharge) but the level of impact is expected to be very low (approximately 3,800 gallons of sewage per day per platform would have negligible effect on water quality and only a small effect on phytoplankton eutrophication).

Sediment resuspension would affect water quality in the region during platform placement and pipeline burial. Suspended sediments could reduce light availability to phytoplankton in the nearshore shallower areas and expose benthic surface feeders and filter feeding benthic and pelagic species to sediment-associated pollutants. Organisms within several meters of the activity could be buried. These effects are expected to be local and of short duration (background suspended particulate levels would be reached

within hours or at most a few days after cessation of the physical disturbance). Toxic effects of pollutants re-exposed could last longer, especially in the case of chlorinated hydrocarbons such as DDT and PCB which are found in high concentrations in sediments near Palos Verdes, California. The likelihood of impacts to water quality from sediment resuspension during placement of platforms and burial of pipelines is high. The level of impact is expected to be very low for water quality because of the limited expected extent of the disturbance in relation to the large area of the region and the expected short duration of disturbance.

More than one-half of the estimated reserves for Southern California OCS are expected to occur in the Santa Barbara Channel. Therefore, the majority of the impacts described above for water quality may also be expected to occur in the Channel. This may lead to concentration of impacts in the Southern California region, for example increasing impacts of formation water in the Channel on water quality there but reducing impacts elsewhere in the region. The effects on water quality of other impact agents discussed could also be concentrated in the Channel but reduced elsewhere. Water transport in the Channel is not known and dilution factors are not possible to accurately estimate. However, it is expected that transport is sufficient to reduce water quality impacts in the upper water column (down to about 200-300 m). Transport or exchange of water masses in the Santa Barbara Basin may be much slower and it is this deep water which may suffer the most impact.

Conclusions. Water quality in the Southern California planning region would be degraded from activities associated with the proposed alternative. The level of impact is expected to be low to moderate for water quality near the activities. Overall, the expected regional impacts on water quality are low.

Cumulative Impacts. The proposed lease schedule will have cumulative impacts on water quality with production from existing and future leases on the OCS, oil and gas activity in State Tidelands, municipal sewage discharges now operating and planned, ocean dumping, and increased vessel traffic associated with expansion of Los Angeles-Long Beach Harbor for a coal export terminal. The magnitude of the cumulative effects on water quality in the Southern California planning area is impossible to estimate precisely at present because the ocean dumping and Los Angeles-Long Beach coal terminal projects are not formulated in detail. The volume of municipal and industrial sewage discharged from Southern California outfalls has grown steadily but slowly in the last few years (SCCRWP, 1980). The five largest dischargers' combined volume exceeds one billion gallons per day and has a high impact on the water quality and marine biota in the nearshore areas (elevated pesticides, hydrocarbons, trace metals in water and sediments, changes in benthic communities) (see discussion in Section IV.B and C, FEIS Lease Sale No. 68, USDOI, 1981).

In addition to the spills and discharges expected on the Federal OCS from oil and gas development, impacts are expected to occur from exploration and development in State of California Tidelands. The cumulative number of spills and volumes of discharge are unknown because data are not available from the State of California. Currently, there are 14 platforms on the Federal OCS and more within State waters (see Section V.D.7.a.1)c)(3)). An

unknown number of additional platforms, artificial islands, and subsea completion systems may occur as a result of resource development in the State Tidelands. The cumulative impacts from development of oil and gas resources in the State and Federal lands offshore on water quality cannot be quantified at present but the impacts are not expected to greatly exceed those estimated below.

In the unlikely event that all Federal OCS tracts offshore Southern California are leased and all resources developed over the life of the proposal (total resource development), the cumulative volumes of expected discharges and cumulative number of spills of crude oil for the proposal (Alternative I-1), existing leased areas either developed or planned for development, and any future lease sales and post-sale activity in the Southern California Federal OCS planning region and import tankering of crude are given in the following table (Table V.D.7.a.1)a)(1)-1).

TABLE V.D.7.a.1)a)(1)-1

CUMULATIVE SPILLS AND DISCHARGES
SOUTHERN CALIFORNIA PLANNING AREA

	Spills (No.)	Drilling Mud (bbls)	Drill Cuttings (cu.yds.)	Formation Water (bbls)	Sewage (gals/day)
Oil/Gas	19.11 ≥1,000 bbl*	7.04×10^6	7.62×10^5	1.64×10^9	2.46×10^5
	10.60 ≥10,000 bbl**				

* 6.5 spills ≥1,000 bbl are expected to occur from development of all oil and gas resources in the planning area; 12.6 spills =1,000 bbl are expected to occur in the planning area from tankering of imported crude (from foreign sources and Alaska).

** 3.1 spills ≥10,000 bbl are expected to occur from total development of Federal OCS hydrocarbon resources in the planning area; 7.5 spills =10,000 bbl are expected in the planning area as a result of import crude tankering.

The cumulative impacts to water quality from the above OCS activities, and anticipated municipal and industrial sewage discharges in the Southern California planning area will be high for petroleum hydrocarbon spills in areas of pristine water such as the windward sides of the Santa Barbara Channel Islands and Tanner-Cortes Banks but low to moderate in nearshore areas such as Whites Point (near sewage outfall) and Los Angeles-Long Beach Harbor areas (low to moderate change in water chemistry except for immediately after the spill). Water quality will suffer moderate impacts from cumulative sources of drilling muds due to turbidity and trace metal dissolution (very low level for latter is expected based on chemistry). Water quality nearshore will have low impacts

due to drilling muds from cumulative sources (areas already affected by terrestrial runoff and longshore transport processes). The level of impacts to water quality from drill cuttings will be very low. Both drill cuttings and muds will affect sediments and sedimentary processes as well as the associated benthic organisms; these impacts are expected to be high to very high in the short term around the points of discharge, and moderate to low for the long term when the whole planning area is considered. Cumulative impacts to water quality from formation water will be low to moderate around platforms and discharge sites nearshore (elevated trace metals and hydrocarbons in the water column) and moderate near discharges in offshore and other pristine environments (Channel Islands, Tanner-Cortes Banks). Cumulative water quality impacts from sewage are expected to be high to moderate near present sewage outfalls to very low near platform discharges far offshore. Overall, the expected regional cumulative impacts on water quality are moderate.

Oil spills, drilling mud, drill cuttings, formation water, and sewage are among the significant impact-producing agents on water quality. The proposal contributes less than 17 percent of the oil spills greater than 1,000 bbl, less than 14 percent of the oil spills greater than 10,000 bbl, less than 48 percent of the drilling mud, less than 48 percent of the drill cuttings, and less than 48 percent of the formation water. The proposal substantially contributes to the cumulative impacts of OCS activity on this resource. With the consideration of non-OCS-related population growth and associated sewage discharge, the proposal is not an important contributor to area water quality degradation whether cumulative impacts include development of all resources offshore Southern California (total resource development), or only resources described for the alternative and non-OCS related projects and proposals.

(2) Water Supply: Adoption of this alternative could place a strain on local water supplies, due to population changes and industrial activities resulting from OCS hydrocarbon development. Fresh water use can be estimated as a direct function of population. The average person uses about 65,000 gallons of water per year. Fresh water needs for OCS-related functions are estimated depending on the type of activity. An exploratory well requires about 1.2 million gallons of water a year, while a production well requires about 970,000 gallons. At least one-third of the water must be potable (Blayney-Dyett, 1981, POCS Technical Paper No. 81-4; NERBC-RALI, 1976, Onshore Facilities Related to Offshore Oil and Gas Development). Gas processing plant water requirements vary depending on the type of cooling system used. It is assumed that most closed cooling systems, which consume insignificant amounts of water, would be used throughout the life of the project.

Water is usually provided locally and can comprise a significant portion of municipal or district budgets. In Southern California, water supply is at critical capacity in most communities and even small increases in demand could have adverse effects. With only approximately 12 inches of rain a year, surface water supplies are 70 percent depleted in an average year, while groundwater wells experience significant overdraft. Currently, most communities rely on imported water to make up deficits. The potential for water shortage will increase after 1985, as a result of the scheduled cut in allotment from the Colorado River by 662,000 acre-feet per year (215.8 billion gallons). Since the Peripheral Canal must still meet citizens' approval, it

is uncertain whether this project will soon alleviate water problems in Southern California.

Population gains caused by OCS-related growth in employment opportunities would exert pressure on the ability of communities to provide additional water. Population increase associated with the proposal is discussed in Section V.D.7.a.2)g)(2). OCS population water needs would be about 4,300 acre-feet per year (AFY) (1.4 billion gallons a year throughout the region). Facilities would require about 3,500 AFY (1.1 billion gallons), which would support 1,131 exploratory and production wells.

The projected level of development resulting from adoption of this alternative will contribute to the deterioration of water supply conditions in Southern California. Since over half the development is expected to occur in the Santa Barbara Channel, the counties of Santa Barbara and Ventura could experience an increase in deficits in water supply along the coast; impacts will be lower in the rest of the planning area. The likelihood of increased deficits in water supplies occurring in Southern California is very high unless water systems are significantly improved.

Conclusions. Water requirements to meet OCS-related demand would increase considerably, putting a strain on existing dwindling supplies. The new demand for water could put pressure on communities to develop methods to meet water deficiencies. Overall, the expected regional impacts on water supply are high.

Cumulative Impacts. In the unlikely event that all tracts offshore are leased and all resources are developed over the extent of the proposal, a significant impact on water supply will occur. Full development of oil and gas resources will result in population increase of approixmately 46,800 new residents, 506 exploratory wells and 1,840 development and production wells.

Water requirements for new OCS-related residents in the region are estimated at about 9,335 AFY (3.0 billion gallons). Exploratory wells would need about 1,850 AFY (602 million gallons) of water, while production wells would require about 5,477 AFY (1.8 billion gallons). Increased State Tidelands development will certainly contribute to the impacts on water supply in Southern California.

The expected cumulative impact on water supply is very high. Due to the increased demand and potential water shortages, local governments could face greater pressure to expand water supplies through additional imports, strict conservation methods, higher prices and/or rationing. The extent of impacts on water supply from State Tidelands and non-OCS-related activities cannot be determined. However, based on current supply conditions and level of consumption, it is estimated that the proposal is an insignificant contributor to the overall cumulative impacts on water supply whether cumulative impacts include development of all resources offshore Southern California (total resource development), or only resources described for the alternative and non-OCS related projects and proposals. Ongoing population growth is the major contributor to cumulative impacts on water supply.

b) Navigation

(1) Ports and Harbors: Four major ports/harbors exist in Southern California: Long Beach, Los Angeles, San Diego, and Port Hueneme. These ports provide access to local and regional markets as well as foreign commerce. OCS crude oil produced within the planning area that is transported by vessels would most likely be shipped from the offshore producing area to the Ports of Long Beach and Los Angeles. For this analysis, it is assumed that 50 percent of the crude oil resulting from this proposal would be tankered, while the remaining 50 percent would be transported via subsea pipeline.

Impacts on ports/harbors from the selection of Alternative I-1 could occur as a result of oil spills and increased shipping activity. It is expected that 3.3 oil spills greater than 1,000 bbl and 1.5 oil spills greater than 10,000 bbl will occur as a result of Southern California lease sales within the proposal. In the event that an oil spill contacted a port, deployment of containment booms or other oil spill equipment could delay the entry or departure of vessels from the port. This type of impact is considered to be a short-term, low level impact. The likelihood of this impact is considered to be low to moderate.

Increased shipping activity is expected to result from the proposed lease sales. The increased use of tankers and barges to transport OCS crude into or out of the ports and harbors, and the increased use of crew and supply boats would have an associated number of space-use conflicts. Vessels require a number of support facilities and berthing space. Increased user charges and/or expansion of port facilities would be likely to result. Very low impacts of this type may occur on the ports and harbors. The probability of these impacts is considered to be high.

For a discussion of impacts to ports and harbors as a result of increased employment, refer to Section V.D.7.a.2)g)(1).

Conclusions. Short-term, low-level impacts to some ports and harbors are expected to occur as a result of the proposal. Overall, the expected regional impacts on ports and harbors are low.

Cumulative Impacts. In the unlikely event that all areas of the Southern California Federal OCS are leased and all resources are subsequently developed over the extent of the proposal (total resource development), the expected numbers of oil spills are: 6.5 spills greater than 1,000 bbl and 3.1 spills greater than 10,000 bbl. In addition to this, 12.6 oil spills greater than 1,000 bbl and 7.5 oil spills greater than 10,000 bbl are expected to result from import tankering to the region. An unknown number of spills are expected to occur from development of additional platforms, artificial islands, and/or subsea completion systems in State Tidelands. A coal export terminal is planned for the Los Angeles or Long Beach Harbor. Southern California ports will continue to be important to commerce in the region and may be expanded to handle additional volume of commercial goods. The cumulative effect of these oil spills and activities could result in moderate impacts to ports and harbors. The probability of these impacts is considered high. The cumulative effect of increased shipping activity would result in low impacts to ports and harbors. The probability of the shipping activity impacts is considered high. Overall, the expected cumulative impacts on ports and harbors are moderate.

Since other, non-OCS-related impact agents have a greater impact on ports and harbors, the contribution of the proposal to cumulative impacts is low whether cumulative impacts include development of all resources offshore Southern California (total resource development), or only resources described for the alternative and non-OCS related projects and proposals.

(2) Marine Traffic: Total fright traffic for the four main ports located between Point Conception and the Mexican Border was 32,836 vessel arrivals (excluding domestic fishing craft, military ships, pleasure boats, and through traffic) for calendar year 1978 (U.S. Army Corps of Engineers, 1978). Of these arrivals, 28,173 were vessels with draft of 22 feet and less. The USDC (1981b) projected the numbers of vessels serving the Ports of Los Angeles/Long Beach and Port Hueneme and passing through the Santa Barbara Channel in each direction as follows: 1980, from 12.4 to 15.7 ships per day; 1990, 13.9 to 19.3; and 2000, 14.7 to 21.7.

Vessel traffic in Southern California is routed through a system of Traffic Separation Schemes and Port Access Routes that are established by the U.S. Coast Guard. A Port Access Route (PAR) exists south of the Los Angeles/ Long Beach Harbor and it is designated as a Precautionary Area (USDI, 1981a, Figure II.B.2). Precautionary Areas within the proposed sale area are described as areas within defined limits where ships must navigate with particular caution. Vessel usage of the above routing measures is not mandatory. However, their use ensures an obstruction-free route and most ship masters abide by them.

The Eleventh Coast Guard District has proposed to reconfigure the present approaches to the Los Angeles/Long Beach Precautionary Area in order to reduce vessel routing conflicts (for details, refer to USDI, 1981a, Section III.C.7). A proposed rulemaking notice will be forthcoming in early 1982. Currently, U.S. Coast Guard policy does not permit exploratory drilling operations or permanent structures (e.g., oil/gas platforms) in Precautionary Areas.

Increased marine traffic (e.g., tankering, crew and supply boats, seismic boats) and offshore infrastructure (211 exploratory wells, 920 development/ production wells, and 37 platforms) is expected to occur in Southern California as a result of the adoption of the proposed schedule. Potential conflicts could arise during the exploration, development, and production phases when these vessels use traffic lanes which cross the proposed leasing area. Maritime military operations occur throughout much of the proposed leasing area. In the event that hydrocarbon-related shipping activities occur in military warning areas, conflicts could occur (see Section V.D.7.a.1)c)(2)). Additional conflicts arise when vessels do not adhere to the designated traffic lanes. These activities could result in an increase in commerce and vessel accidents. Accidents could result in a loss of human lives, personal injuries, property damages, and oil spills.

As a result of increased marine traffic (e.g., tankering, crew and supply boats, seismic boats) and offshore infrastructure, moderate impacts on marine traffic could occur. Based on the amount of vessel traffic expected from the proposal the likelihood of these impacts is considered to be moderate. During peak periods of exploration and development (1985-1990), the likelihood of these impacts would be high.

It is expected that over half of the predicted resources for the Southern California planning area occur within the Santa Barbara Channel. Furthermore, most existing infrastructure in the planning area (60 out of 70 structures) occurs in this channel. As a result, exploration, development, and production activities and associated impacts will tend to concentrate within the Santa Barbara Channel. Therefore, moderate impacts are highly probable within the Santa Barbara Channel.

In the event that the proposed Port Access Route is not adopted, then current U.S. Coast Guard (USCG) policy concerning hydrocarbon activities in shipping areas would continue to be upheld. Impacts to marine traffic and ports under current USCG policy would be the same as the impacts that are described above. It is current USCG policy not to permit temporary or permanent hydrocarbon-related structures within vessel traffic lanes or precautionary areas. In the event that temporary and/or permanent structures are permitted within traffic lanes or precautionary areas, the probability of a high impact on marine traffic would be high.

Increased employment in the local shipping industry would result following the adoption of Alternative I-1. This impact is discussed in Section V.D.7.a.2)g)(1).

Development of offshore platforms following the proposed lease sales could provide a benefit to navigation through lighting, distinct markings and colors, fog horns, radar, and other navigational aids.

Conclusions. Moderate impacts to marine traffic is expected to occur, particularly during the period of peak development (1985-1990) as a result of increased shipping activity (e.g., tankering, crew and supply boats, seismic boats) and offshore infrastructure. Overall, the expected impacts on marine traffic are moderate.

Cumulative Impacts. In the unlikely event that all tracts in the Federal OCS planning area are leased and developed (total resource development), it is predicted that 506 exploratory wells, 1,840 development/production wells within the life of the proposal, 88 platforms (including 14 existing Federal platforms), and at least one OS&T will result. These numbers are based on development resulting from Alternative I-1, presently leased Federal OCS lands, and future production. Also included are 14 existing Federal OCS platforms. Currently, there are 9 platforms, 7 artificial islands and 39 subsea completion systems in State Tidelands. An unknown number of additional platforms, artificial islands, and/or subsea completion systems may occur as a result of resource development in the State Tidelands. The cumulative effect of these increased hydrocarbon development activities (including increased shipping activity) may result in high impacts on marine traffic. The likelihood of this impact is high. Overall, the expected cumulative impacts on marine traffic are high.

The proposal contributes less than 38 percent of the platforms and less than 42 percent of the exploratory wells. Since exploration, development and production activity is a significant impact-producing agent on marine traffic, the proposal is a substantial contributor to cumulative impacts on this resource category whether cumulative impacts include development of all

resources offshore Southern California (total resource development), or only resources described for the alternative and non-OCS related projects and proposals.

c) Other Uses of the OCS

(1) Ocean Dumping: Ocean dumping has been and still remains an accepted means of disposal of waste material from the coastal states. Off the coast of Southern California, there are 35 designated historic and active dump sites. The materials dumped at each of these sites depends upon the type of permit issued by the Environmental Protection Agency. These materials range from dredge spoils, to low level radioactive waste, to obsolete munitions, to entire ships.

The location and contents of these 35 sites are described below. In Southern California waters, there are five active dredge spoil sites. These are: one off Port Hueneme, one off Long Beach, one off Newport Beach, and two off San Diego. All five of these sites are on the Federal OCS, range from 3.8 to 6 nautical miles from shore, and has a 1,000-yard radius. Radioactive waste accounts for five sites, all on the OCS. Two of these are located over 200 nautical miles west of San Diego in water over 1,200 fathoms, one is located 90 miles southwest of San Diego in 1,000 fathoms of water, and the other two are about 20 miles south of Santa Cruz Island in about 1,000 fathoms. These sites are large in areal extent, the smallest having an area of 80 square miles. Of the remaining 25 designated sites, 2 are within 3 nautical miles of land and 23 are on the OCS.

Dump sites are subject to impact from offshore development only if they are directly contacted. This contact would be from the actual placement of a platform, subsea completion, or pipeline. The impact incurred would depend upon the type of material comprising the dump site. Dredge spoils would have an impact on benthic life in the immediate area of disturbance, and would be similar to that observed from drill cuttings. Toxic chemicals could be dispersed through the water column and over the immediate surrounding areas, but would be diluted and become less hazardous with distance from the disturbance. Impacts of drilling muds and cuttings are discussed in Section V.D.7.a. 1)a)(1). Radioactive waste creates a potential impact to human life, with any leakage from the radioactive containers possibly progressing up through the food chain. Munition dumps and ship disposal areas would cause impact if contacted due to the potential instability of the munitions, and the in stability of the bottom caused by ships' hulls. If a site is impacted, the impact could range from very low to very high depending upon the material in the dump site, but would be restricted to the immediate local area.

The likelihood of contact and, therefore, impact from one of the 37 platforms expected to result from the adoption of the proposed schedule is extremely low as most sites have known locations and can, thus, be avoided. Nondesignated or unknown sites are few enough in number to create an extremely low probability of being affected by a structure. As the majority of development in Southern California is expected to occur within the Santa Barbara Channel and existing designated dump sites are well mapped in the area, no impacts are expected to occur. However, negative impacts may occur if structure

placement contacts dumped material of nondesignated sites. The shallower sites have a greater possibility of being affected than the deeper sites; thus, an impact on one of the radioactive dump sites is considered to be almost nil since all known sites are in deepwater, outside the most favorable geologic areas. The likelihood of any impact occurring is considered to be very low. Overall, the regional impacts on dump sites are expected to be very low. Since development from the proposal will tend to stay clear of known dump sites, and the possibility of coming in direct contact with one of the undesignated sites is very slight.

Conclusions. Due to past and present ocean dumping activities, potential for disturbance of toxic and other waste material exists on the OCS. However, since it is unlikely that any dump sites will be contacted, the overall expected regional and localized impacts are very low.

Cumulative Impacts. In the unlikely event that all resources offshore Southern California are leased and developed (total resource development), there could be a total of 88 platforms and 1 OS&T on the Federal OCS. These structures and subsea completion systems will only slightly increase over that described above (see Section V.D.7.a.1)a)9(1). It is not expected that oil and gas development in State waters will affect dump sites as the two dump sites located within 3 miles of shore are adequately protected by their location. Dumping will continue at sites presently being used and those to be used in the future will have increased positional accuracy. Careful designation and mapping of sites (existing and future) by EPA will ensure avoidance by structure placement on the Federal OCS and in State Tidelands.

The proposal contributes less than 38 percent of the platforms expected for the region. Since platforms, pipelines and subsea completions are the most significant impact-producting agents on dump sites, the proposal substantially contributes to the cumulative impacts on this resource category whether cumulative impacts include development of all resources offshore Southern California (total resource development), or only resources described for the alternative and non-OCS related projects and proposals. Overall, the expected regional and local impacts are very low.

(2) Military Uses: Essentially all of the Southern California OCS is used for various military operations. The key exception is the Santa Barbara Channel, where the oil industry has been active historically. The military groups active in the area include the Western Space and Missile Test Center located at Vandenberg AFB, the Pacific Missile Test Center at Point Mugu, and the Fleet Area Control and Surveillance Facility in San Diego. The activities include surface-to-surface, air-to-air, and surface-to-air live missile firing and testing, flight training, surface and submarine fleet maneuvers, aircraft testing, and anti-submarine warfare operations (Vanderpool, 1981). Many of these activities are conducted on a daily basis and are considered incompatible with permanent or semi-permanent OCS hydrocarbon development or exploration activities. Much of the current military operations are considered vital to overall national defense with the uniqueness of the Southern California coast precluding some activities from being conducted elsewhere (Foster, 1981). The main concern of the military regarding OCS oil and gas activities is space. Any increased OCS activity by the oil industry potentially removes space from military operations beyond

the concessions already made for previous sales, forcing the alteration and/or curtailment of certain activities. Coordination prior to each sale between the Departments of Defense and Interior has always been assured regarding OCS usage, eliminating or minimizing any conflicts.

Although area-wide lease sales are being considered, exploration and development is expected to take place in concentrated areas of high hydrocarbon potential. More than half the estimated hydrocarbon resources for Southern California are assumed to be in the Santa Barbara Channel. The possibility of scattered activity, outside the areas of high potential is, however, created with area-wide leasing, and would necessitate further coordination between the military and the oil industry.

The regional level of impact on military operations is expected to be moderate, due to the extensive military operations being conducted on most of the Southern California OCS and the high level of interest by the oil industry. Adoption of the proposed schedule is expected to result in the addition of 37 platforms and 211 exploratory wells (with the accompanying support activity) to the planning area. The likelihood of impact is moderate, as most oil industry activity expected to take place will be in areas of favorable geologic formations, such as the Santa Barbara Channel where the oil industry is already active. Once an area is removed from military use, any increases in other uses of that area have no further impact on military operations. For this reason locally, in the Santa Barbara Channel, the impacts are expected to be low.

In addition to the existing regulations and laws designed to reduce impacts (see Sections I.B.4 and 5), seven lease stipulations have been employed in past Pacific area OCS sales. The standard military stipulations (Nos. 1 and 2) relate to electromagnetic interference, shelter/evacuation, and holding harmless (liability). These have been enacted in the past, assuring joint usage coordination between the military and the oil industry. It is believed that these stipulations would adequately mitigate any potential conflicts to tracts in question. Serious problems would be raised between the military and the oil industry without the emplacement of the standard military stipulations.

Conclusions. Overall, moderate regional impacts are expected from space-use conflicts between the oil industry and the military, increasing slightly the risk of major accidents. Although the Santa Barbara Channel is the area of highest industry interest, low impacts are expected in this area since the oil industry is already active and military activity is minimal in the channel.

Cumulative Impacts. Although low levels of impact can be expected to other projects such as the Space Shuttle and the MX Missile, moderate to high impacts are anticipated in the unlikely event of full development of OCS oil and gas resources and State Tidelands resources over the life of the proposal (total resource development). The total development scenario for all the resources in the Southern California Federal waters predicts 74 platforms and 506 exploratory wells. This alternative will contribute less than 38 percent (37 platforms) of the entire number of existing and predicted platforms in Southern California, in both State and Federal waters. This contribution is

considered to be a substantial portion of the cumulative impacts. The majority of the Federal development is expected to occur in the Santa Barbara Channel, where military activity is minimal. The activity associated with this proposal's potential development especially platform installation and location of drilling vessels, as well as the support vessels/helicopters servicing them, will preclude or restrict military operations in specific areas outside the Channel for the life of the development (30 years). Therefore the activities will cause a moderate to high increase in cumulative impacts on military activity whether cumulative impacts include development of all resources offshore Southern California (total resource development), or only resources described for the alternative and non-OCS related projects and proposals.

(3) Offshore Oil and Gas Infrastructure: Infrastructure in this category includes platforms, artificial islands, subsea completions, pipelines, offshore separation and treatment (OS&T) vessels, and exploratory rigs. For the purpose of discussion in Sections V.D.7 and 8, the term structures refers to platforms, artificial islands, and subsea completion systems. Currently, there are 15 of these structures in the Southern California Federal OCS area: 14 platforms and 1 OS&T vessel. Exploratory rigs are present only on a temporary basis (usually less than 100 days in one place). There are 55 structures currently located in the State Tidelands off Southern California: 9 platforms, 7 artificial islands, and 39 subsea completion systems (refer to USDI, 1981a, Section III.C.6.b.). Pipelines are used to transport oil and gas that is produced from the offshore platforms either to shore, or to an offshore treatment facility (i.e., the OS&T). Presently there are 21 oil and/or gas pipelines with a total length of 110 miles (177 km) on the Federal OCS. State waters support 14 oil pipelines with a total length of 34 miles (55 km) (refer to USDI, 1981a, Section III.C.6.c.).

Exploration and development activities following the proposed lease sales described in Alternative I-1 would result in an addition of 211 exploratory wells, 920 developmental/production wells, and 37 new platforms in the Southern California Federal OCS planning area. Concomitant with new platform placement is the installation of subsea pipelines. Impacts to offshore pipelines and subsea completion systems could result from the following exploration and development activities: anchoring of exploration rigs, pipeline lay barges, and boats associated with platform placement; platform placement itself; and activities that ensure that the pipeline right-of-way is compatible with commercial fishing (e.g., the smoothing of anchor scars by dragging chains or bars along the ocean bottom). During periods of adverse weather conditions or vessel operator error, the activities described above could damage pipelines and/or subsea completion systems. Impacts to these structures may result in oil spills and replacement and/or repair costs. It is expected that over half of the predicted resources for the Southern California planning area occur within the Santa Barbara Channel. Furthermore, most existing infrastructure in the planning area (60 out of 70 structures) occurs in this Channel. As a result, exploration, development, and production activities and associated impacts will tend to concentrate within the Santa Barbara Channel.

During periods of peak exploration and development activity (1985-1990), impacts to offshore pipelines and subsea completion systems in the Santa

Barbara Channel could be moderate. The likelihood of this impact would be moderate. During nonpeak years of development, the likelihood of impact would be reduced to low. Large oil spills occurring from pipeline damage are considered to be unlikely due to the safety equipment and valves that regulate the flow of hydrocarbons through the system. During the period of peak activity outside the Santa Barbara Channel, impacts to offshore pipelines and subsea completion systems could be low. The likelihood of this impact would be low. During nonpeak years of development, the likelihood of impact would be reduced to very low.

Impacts to the existing oil and gas infrastructure will also occur as a result of increased vessel activity (e.g., tankering, crew and supply boats, seismic vessels) following the lease sales proposed in Alternative I-1. There will be an increased risk of collision with existing infrastructure during periods of adverse weather conditions. Maritime military operations occur throughout much of the proposed leasing area. In the event that hydrocarbon development occurs near military warning areas, conflicts could occur (see Section V.D.7.a.1)c)(2)). Any of the above incidents may result in oil spills, loss of human lives, personal injury, and loss of equipment. Exploration, development, and production activities and associated impacts will tend to concentrate within the Santa Barbara Channel, as previously described. Low-level impacts of this type could occur on offshore infrastructure within the Santa Barbara Channel. The probability of these impacts would be high. Impacts on infrastructure outside the Santa Barbara Channel could also be low. However, the likelihood of this impact is moderate.

Conclusions. Moderate impacts to offshore pipelines and subsea completion systems in the Santa Barbara Channel are expected to occur during peak periods of exploration and development activity (1985-1990) and may occur during nonpeak year of development. Low impacts to these structures outside the Santa Barbara Channel may occur during peak years of development but are unlikely to occur during nonpeak years of development. Anticipated increases in vessel activity (e.g., tankering, crew and supply boats, seismic vessels) are expected to cause low-level impacts on offshore infrastructure within the Santa Barbara Channel. Impacts on infrastructure outside the Santa Barbara Channel likely to be low. Overall, the expected impacts on offshore in frastructure are low to moderate.

Cumulative Impacts. In the unlikely event that all tracts in the Federal OCS planning area are leased and developed over the life of the proposal (total resource development), it is predicted that 506 exploratory wells, 1,840 development/production wells, 88 platforms (including 14 existing Federal platforms) and at least one OS&T vessel will result. These numbers are based on development resulting from Alternative I-1, presently leased Federal OCS lands and future production. Also included are existing Federal OCS structures. Currently, there are 9 platforms, 7 artificial islands and 39 subsea completion systems in State Tidelands. An unknown number of additional platforms, artificial islands, and/or subsea completion systems may occur as a result of continued resource development in the State Tidelands. The cumulative effect of total development of the resources would result in a high probability of moderate impacts to offshore infrastructure. It is highly likely that moderate cumulative impacts on offshore infrastructure would occur as a result of

increased vessel activity. Overall, the expected cumulative impacts on offshore infrastructure are moderate.

The proposal contributes less than 38 percent of the platforms and less than 42 percent of the exploratory wells. Since exploration and development activity is the most important impact-producing agent on offshore oil and gas infrastructure, the proposal significantly contributes to the cumulative impacts on this resource category whether cumulative impacts include development of all resources offshore Southern California (total resource development), or only resources described for the alternative and non-OCS related projects and proposals.

d) Land Use: This section describes impacts associated only with development of oil and gas infrastructure. Population-related land use impacts are described in Section V.D.7.a.2)g).

Impacts on land use will result from the demand for land for onshore facilities necessary to support the exploration, development, production, and transportation phases of OCS oil and gas activity. The only new Southern California onshore infrastructure requirement for exploitation of the resources from this alternative would be a gas pipeline in the vicinity of San Diego Harbor. Other local infrastructure needs are expected to be met through expansion of existing facilities and continued use of temporary facilities.

Expansion of existing OCS-related infrastructure may compete with other industrial activities in Southern California. Successful expansion of OCS-related infrastructure will be dependent upon relative profitability of the activities and compliance with management plans of coastal resources. Available coastal land for industrial activity is limited and an increase in demand for this commodity would raise prices, encourage substitution of less desirable land for prime coastal acreage, and could cause a shift in the activities pursued by those already working in coastal activities (i.e., commercial fishing operators shift to supply and crewboat operations).

Expansion of OCS-related infrastructure is expected to occur primarily in Santa Barbara-Ventura and will result in no significant changes in coastal zone land use mix. The expansion of facilities can occur because of under utilization of current sites and industrial zoning of lands adjacent to current facilities. An example of the expansion potential of Southern California oil and gas infrastructure are separation and treatment facilities of which approximately 46 percent can be expanded. Seventy-five percent of the separation and treatment facilities currently handling OCS production are capable of expansion. The type of facilities to be expanded and typical acreage requirements are as follows: 1) permanent service bases (50-75 acres), 2) bases supporting platform and pipeline installation (5-10 acres), 3) partial processing facilities (15 acres per 100,000 barrels of petroleum), 4) gas processing and treatment plants (50-75 acres), and 5) marine terminals (30-100 acres). It is expected that expansion of existing facilities would require less acreage than entirely new facilities, because of sharing of access, offices and other services.

The anticipated rapid development of resources as is predicted in Alternative I may necessitate the construction of new platform fabrication yards in the

Pacific area to serve the Alaska and California markets. The location and scheduling of such new facilities are difficult to predict as both are influenced by a number of market factors. It is unlikely that new platform fabrication yards will result from this alternative because of environmental concerns, international competition, and West Coast labor costs. Chicago Bridge and Iron Company (CBI) is the only confirmed proposal for a new yard in the Pacific area. No permit has been issued at this writing for the CBI project in the Straits of Georgia, Washington. The evaluation of the compatibility of proposals for new platform fabrication yards and the expansion of existing facilities with local and State coastal zone management plans and other management plans will be performed by the responsible agencies during the permit process.

With more than 50 percent of the resources located in the Santa Barbara Channel, significant impacts on the Santa Barbara-Ventura County portion of the planning area are expected. Continued expansion of OCS-related activities could contribute to a potentially severe shortage of coastal and near coastal lands available for industrial and commercial development.

The full development of resources related to this alternative is expected to require expansion of OCS-related activities and moderately constrain land availability in Santa Barbara-Ventura. Construction of a new gas pipeline in the San Diego vicinity would require opproximately 10 miles of 50 foot wide right-of-way and is likely to occur only if gas is found in sufficient quantities.

Conclusions. Impacts on land use are expected to be low on a regional basis. However, Santa Barbara-Ventura will suffer moderate land use conflicts in coastal and near coastal areas as a result of this alternative. Overall, the expected regional impacts from this alternative will be low.

Cumulative Impacts. In the unlikely event that all tracts offshore Southern California are leased and all resources are developed (total resource development), the resulting cumulative impacts of OCS oil and gas activity, increased State Tidelands development, the proposed San Pedro Bay Coal Terminal, the MX project, the Space Shuttle, Port Hueneme expansion, and the Point Conception LNG facility will be to significantly reduce the available supply of land for industrial and commercial development. On a regional basis, these projects are expected to result in a low impact, however, the Santa Barbara-Ventura portion of the planning area will suffer moderate impacts. The impacts on land use are primarily related to economic activity and population growth. The proposal's overall contribution to the impacts on land use are low whether cumulative impacts include development of all resources offshore Southern California (total resource development), or only resources described for the alternative and non-OCS related projects and proposals.

e) Cultural Resources

(1) Offshore Cultural Resources: The cultural resources subject to impact offshore include prehistoric and historic sites of varying significance. Several prehistoric submerged sites are already known, mostly in the La Jolla region, but investigations have not been extensive. The early Spanish chroniclers report an extensive marine based cultural system

for the Santa Barbara-Los Angeles area. The Chumash and Gabelino were known to regularly travel to the Channel Islands and interact with resident island populations. Because of destructive wave action during transgression episodes, submerged prehistoric sites are most likely to occur in low energy areas like lagoons, estuaries and protected areas. Site location predictions are difficult due to the problem of identifying low wave energy areas from the geologic record of the last 40,000 to 150,000 years.

The historic submerged sites are mostly shipwrecks, aircraft and a few partially submerged terrestrial sites. There are over 1,500 known and recorded shipwrecks off the coast of California, about one-third of which are known to be in Southern California waters. The number of downed and submerged historically significant aircraft is not well known but is suspected to be high given private and military air and aerospace activities in Southern California. Two historic, partially submerged, sites currently being investigated are the Santa Barbara cannon find and Fort Guijarros in San Diego. The significance of any shipwreck is partially dependent upon its state of preservation. Preservation can be dependent upon a number of factors, including but not limited to sedimentation rate, force of the current, and the stability of the bottom (slides, slump areas).

The most important impact agents to submerged sites are bottom-disturbing activities. This includes, but is not limited to, pipelaying activities such as trenching, use of a lay barge or pull barge and positioning anchors; use of positioning anchors with exploration drilling and coring ships; construction and anchoring of platforms; well drilling; and any bottom dragging activity to recover lost items. These activities disturb the overlaying sediment layers to varying depths and degree thereby exposing buried resources to the destructive action of the ocean or by directly disturbing or destroying a site. The amount of area disturbed varies with the activity. It may be a linear area caused by pipelaying activities or a large semicircular area caused by positioning anchors. Anchors are able to disturb an area up to twelve times the water depth because of dragging, shifting, and placement activities. A bottom-disturbing activity impacting a cultural resource site is considered to be a significant destruction of the site since the destruction of a site is permanent and irreversible. Therefore, the level or intensity of impacts to submerged cultural resources is very high when a resource is contacted by these activities. Impact potential is likely to be higher in the Santa Barbara Channel than elsewhere in the planning area because of the concentration of development in the Channel and a higher probability of submerged site occurrence. Over half of the OCS exploration and development in Southern California is projected to occur in the Channel area.

The likelihood of disturbing submerged cultural resources is influenced by several factors. The potential for prehistoric cultural resources is for the most part limited to water depth of less than 150 m, the approximate lower limit of sea level regression during the last 40,000 years. The exception may be the Channel Island areas where inter-island and island-mainland travel was fairly common. There are recorded accounts of ceremonial disposal of items in the Channel by the Chumash. The probability of submerged sites is also limited by the destructive force of the waves during sea level transgression and regression. Sheltered areas, like lagoons and estuaries, and low energy beaches would have higher site potential. In Southern California, most areas

with water depths of less than 150 m are within 3 miles of shore and are under State control. Historic submerged cultural resources are also predominantly found in State waters, but this does not reduce the possibility of shipwrecks occurring in Federal waters. Vessel drift after abandonment, navigational errors, and reporting errors are factors that affect the actual location of a shipwreck and, thus, ships reported lost in State waters may actually be in Federal waters. Lease areas opposite sheltered harbors, prominent points, rocky outcrops, submerged reefs, and along shipping routes would have a higher potential for containing historic cultural resources. These cultural resources in State waters would be subject to impact from pipelaying activities from Federal OCS development and from State-authorized development, while cultural resources in Federal waters would be subject to impact from all federally approved bottom-disturbing activities.

The expected impacts to cultural resources from Federal OCS development in the planning area are low to moderate giving consideration to the probable location of most cultural resources in State waters (and therefore no anticipated impact from exploration or platform placement, only possibly disturbance from pipeline placement activities), to the large area with water depths greater than 150 m, to the destructive action of sea level transgression on submerged sites, and to the limited area of potential occurrence with respect to OCS development. The Santa Barbara Channel, with approximately half of the proposed development, also has the highest potential for submerged cultural resources. The expected impacts to cultural resources in the Channel are moderate. The expected impacts also are moderate opposite low energy areas (lagoons, estuaries, and beaches) whose presence can be traced back through the geological record and in the vicinity of known concentration of shipwrecks. The Cultural Resource Protective Stipulation, if invoked, may reduce these impacts, especially in areas where moderate impacts are expected.

Unauthorized and illegal collecting of artifacts is another impact to submerged cultural resource sites. Divers employed by the industry have been known to collect artifacts and/or to inform other divers of site locations and, thus, increase the potential for site destruction. Collection of artifacts destroys site integrity and reduces the information available for interpretation and analysis. The potential for this type of impact is higher during the development phase when more divers are used. The expected impacts to cultural resources from these activities are low. The likelihood of these impacts be reduced by increasing the divers' awareness of the results of collecting through some type of cultural resources education program.

Existing development may impact future research and the ability to interpret remote sensing data by placing permanent sources of magnetic anomalies on the ocean floor. Even though an area is surveyed prior to development, new techniques, technical improvement of the equipment, and other factors may improve the ability to locate cultural resources by remote sensing and, thus, encourage resurveys of areas. Magnetic anomalies from abandoned well-heads, lost equipment, and other sources will impede interpretation of the data and may mask the record of a smaller or weaker anomaly source. The current practice of avoiding magnetic anomalies rather than conducting further identification investigations may result in an inability to relocate the original anomaly sources for further research and investigation should a more powerful, masking magnetic source be located nearby. As more development occurs, there

will be more sources of magnetic anomalies especially when considering the 30-year life of most development projects. The impacts from a modern magnetic anomaly masking one of a cultural resource are expected to be moderate, especially in shallower waters and along historic shipping routes. In areas where development is concentrated, such as the Santa Barbara Channel, the number of modern magnetic anomalies will increase at a rapid pace and the possibility of masking will also increase.

Oil spills are expected to have little impact upon submerged cultural resources, and then only if the oil settles on the artifact. Oil may mask the outline of an artifact or it may interfere with remote sensing recognition. Only oil heavy enough to settle to the ocean floor will impact submerged cultural resources. The likelihood is expected to be low.

Overall, the expected regional impacts to submerged cultural resources from all activities described above are low to moderate. In areas with conditions favorable to the occurrence of submerged cultural resources, impacts are expected to be moderate. Should a significant submerged cultural resource be impacted, the destruction is permanent and irreversible.

If the Cultural Resource Stipulation which has been adopted for specific areas in past Pacific OCS sales is employed for each Southern California sale in the proposal, a reduction in the impacts from OCS development to cultural resources is expected. The stipulation provides for remote sensing surveys conducted on those tracts deemed to have cultural resource potential and requires an interpretation of the surveys with a written report by a qualified marine survey archaeologist. The survey is a sampling survey and, thus, cannot guarantee the nonexistence of cultural resources should none be recorded. Selection of tracts for invocation of the Cultural Resources Stipulation is based upon the best available data regarding site probability (DOI, 1980b). Because of limitations in the ability to detect cultural resources even with the stipulation, there is still expected to be some loss to the resource.

Conclusions. In areas with conditions favorable to the occurrence of submerged cultural resources, impacts are expected to be moderate. Overall, the expected regional impacts to submerged cultural resources are low to moderate.

Cumulative Impacts. In addition to the impacts discussed above, impacts to cultural resources from other projects may be expected if they disturb the sea floor. Of concern here are the expansion of any ports or harbors, sewage outfalls, State Tidelands development and ocean dumping. All of these activities can increase the impacts to submerged cultural resources in ways similar to those identified above. Bottom dragging activities to recover rocket hardware from Vandenberg launches could significantly impact submerged cultural resources depending upon the location. In normal launch operation, this is not expected to be an impact consideration but should an accident or malfunction occur, especially with the space shuttle launches, near shore dragging could occur in waters less than 150 m deep. In the unlikely event that all Federal oil and gas resources are leased and developed within the life of the proposal (total resource development), 74 platforms would be constructed, each with at least one pipeline for service needs or hydrocarbon transport.

In addition, 2,346 exploration development and production wells would be drilled. An unknown number of platforms, artificial islands, and subsea

completions may occur as a result of State Tidelands development, this is very significant because of the higher potential for sites, both historic and prehistoric in State waters. The cumulative impacts to cultural resources from the proposal, existing leases, and leases with proven reserves would be moderate for the region, particularly in the Santa Barbara Channel area. This area was the home of a highly developed maritime-oriented culture when the Spaniards arrived and has seen extensive shipping from the earliest historic settlements until present. If the Cultural Resource Stipulation is used, the cumulative impacts may be reduced. If it is not used, then the potential for the loss of a valuable irreplaceable resource is moderate.

Based on the estimated cumulative development for Southern California, the proposed five year schedule, through its lifetime, will contribute 38 to 48 percent of the cumulative development. This development will occur on the Federal OCS where the potential for cultural resource occurrence is low except in specific locales. The contribution of this proposal to the potential for cumulative impacts is low but still significant whether cumulative impacts include development of all resources offshore Southern California (total resource development) or only resources described for the alternative and non-OCS related projects and proposals, since the destruction of a significant site is permanent and irreversible.

(2) Onshore Cultural Resources: Prehistoric and historic sites can provide information regarding the past lifeways of the peoples of California: Native Americans, Spanish, Anglo, Asian, and others. These sites can provide information now and, if protected and preserved, they can provide information in the future when new recovery techniques are available and with new investigative orientations.

There are numerous sites, historic and prehistoric, along the coast that have National, State or local significance and are listed in the National Register of Historic Places. Many of these sites are in the coastal zone or within the influence of the coastal zone. These sites are protected by the provisions of the National Historic Preservation Act, as amended, and other protective legislation and regulations. Significant sites not yet listed on the National Register also are protected by Executive Order 11953.

With the increased awareness of their cultural and spiritual past as recognized by the Native American Religious Freedom Act, the Native Americans of California have an increased desire to collect for ceremonial purposes marine species that live in intertidal areas. In addition, there is an unknown number of Native Americans using the intertidal areas for subsistence gathering. Subsistence gathering is also practiced by other ethnic groups, most predominately the recent immigrants from Southeast Asia. Most intertidal collecting is illegal.

The visual intrusion of OCS development and exploration may impact the cermonial and religious practices of Native American and other ethnic groups. Native Americans have stated that the visual presence of offshore development interferes with ceremonial and spiritual activities. Of special concern is the Point Conception area, considered by them to be the western gateway to the spirit world. Visual impact also may occur to National Register sites through introduction of intrusive or incongruent influences to the historic nature of the property.

Surface-disturbing actions have the potential to destroy or disturb terrestrial prehistoric and historic sites. Activities with this potential include, but are not limited to, pipelaying activities, construction or expansion of support and processing facilities, construction of temporary facilities for short-term projects, and oil spill cleanup. Destruction of a site removes forever a body of knowledge that could be useful in interpreting our past. Disturbance of a site is a lesser degree of destruction; some data is still available, but its value is reduced because the range of data or entire site compenents are missing. Any loss only further reduces data resources already under severe pressures from non-OCS-related development. There are a total of 37 platforms proposed for the Southern California area and it is assumed that there will be at least one service (electrical, water, etc.) or production (gas, oil, etc.) pipeline for each platform. With over half of the proposed development occuring in the Santa Barbara Channel, there is a good liklihood of onshore support construction occurring of either temporary or the expansion of existing facilities. Since State and local jurisdictions have primary authority over terrestrial activities, it is assumed that their requirements for cultural resource protection will significantly reduce the likelihood of sites being disturbed or destroyed. There is always the possibility of undetected site being destroyed during the construction process. However, the expected impacts to cultural resources from onshore OCS-related development are low.

With a prediction of 3.3 spills greater than 1,000 bbl and 1.5 oil spills of greater than 10,000 bbl, there is a high probability that there will be low oil spill-related impacts to cultural resources and to subsistence or cermonial gathering. The cleanup of oil spills that have reached the shore could be the cause of cultural resource site loss since there is often a crisis atmosphere prevailing during an oil spill incident. This may preclude proper identification and avoidance of any site prior to cleanup efforts. The concentration of development in the Santa Barbara Channel increases the risk of an oil spill impacting terrestrial cultural resources in an area known to have a very high number of sites. If cultural resources in an area tion and protective measures are imployed as part of the operating procedures for cleanup efforts, this risk may be reduced. The oil spill itself may seriously affect the intertidal area (refer also to V.D.7.a.2)a), Coastal Ecosystems) and impact the subsistence and cermonial gathering of Native Americans and other ethnic groups. The likelihood of an oil spill occurring in areas of religious or ceremonial significance is increased if development is concentrated in the area around Point Conception. For families that rely on this gathering in providing basic food supplies, this impact could be catastrophic. Overall, the expected regional impacts from oil spills throughout the planning area are low. However, localized impacts from oil spills can range from moderate to very high depending upon the existence of terrestrial sites, intensity of intertidal collecting and the degree of dependency on intertidal subsistence gathering.

Platforms and drillships may visually intrude on the ceremonial and spiritual nature of special places to Native Americans and other ethnic groups. There are 37 expected to result in Southern California from the proposal with over half expected to be in the Santa Barbara Channel. Should development in the Santa Barbara Channel concentrate in the Point Conception area, the potential

for visual intrusion to ceremonial sites increases. Other significant sites are known to exist, but locational data are limited. In urban areas, visual impact to National Register sites is expected to be minimal because of the existing high levels of surrounding development. In less developed areas, the impact may be significant and could impact the property in terms of its National Register criteria. The likelihood of visual impacts impacting Native American or other ethnic group's ceremonial or sacred sites or National Register sites is very low in the total planning area. The likelihood of local visual impacts, specifically Point Conception, is low.

Regionally, the expected impact level to terrestrial cultural resources is low. The responsibility for protecting onshore cultural resources rests mainly with State and local jurisdictions. Localized impacts may occur that are site specific; the expected impact of localized occurrence may be moderate to high.

Conclusions. There will be some loss of cultural resources from OCS-related onshore activity. Impacts in the Santa Barbara Channel will tend to be moderate to high since development will be concentrated in this area. Overall the expected regional impacts from the proposal are low.

Cumulative Impacts. The terrestrial cultural resource base is constantly being reduced by development projects. Combining the potential for onshore OCS-related development with the high amount of development already occurring or proposed for the coastal area continues the threat to an already heavily impacted resource. State and local laws and regulations are expected to require mitigation of impacts to cultural resources from onshore development. Federal regulations require mitigation of impacts to cultural resources caused by Federal projects. A cumulative total of 74 platforms, each with at least one associated pipeline and 2,346 exploration, development and production wells is forecast for total development of Federal oil and gas resources in oil and gas resources are leased and developed over the life of the proposal (total resource developement). Terrestrial impacts from the development of leasing of all resources is expected to be restricted mainly to pipelines and oil spill cleanup should be low. With a preponderance of development occurring in the Santa Barbara Channel, there is a probability of impacts to terrestrial cultural resources, physically to sites and visually to Native Americans. The impacts of visual intrusion from development of existing leases and future leases will be most significant in the Point Conception area because of the area's significance to Native Americans. Other areas of visual impact may become identified as development occurs and intrudes upon the use of an area. The predicted spill rates of 6.5 spills greater than 1,000 bbl with an additional 12.6 spills of greater than 1,000 bbl from import tankering, and 3.0 spills greater than 10,000 bbl with 7.5 spills over 10,000 bbl from import tankering. These total oil spill predictions of 19.1 spills over 1,000 bbl and 10.6 spills over 10,000 bbl indicate a high probability of impact to intertidal gathering places and to archaeological sites from cleanup activities. State tidelands development is expected to occur over the life of the project but at an unknown rate or intensity. Any associated onshore development will increase the potential for impact to cultural resources. The long-term impact to cultural resources from OCS-related activity and other projects is expected to be moderate.

The proposal contributes less than 17 percent of the predicted spills over 1,000 bbl and less than 14 percent of the spills over 10,000 bbl, while approximately 42 percent of the cumulative total of new platforms and associated pipelines on the Federal OCS will result from the proposal. The contribution to the cumulative impact of this proposal is low whether cumulative impacts include development of all resources offshore Southern California (total resource development) or only resources described for the alternative and non-OCS related projects and proposals, since non-OCS-related impact agents have the greatest impact on terrestrial cultural resources.

2) Impacts of Special Concern

a) Coastal Ecosystems

(1) Intertidal: Intertidal shorelines consist of rocky, boulder, and sandy beaches. In Southern California, 80 percent of the upper intertidal mainland shorelines are sandy beaches, while 20 percent are rocky. Rocky substrate (bedrock and boulder) increases to 35 percent of the lower intertidal zone; the remaining lower zones are sandy.

The rocky and boulder intertidal beaches of Southern California support a very diverse and abundant assemblage of invertebrates, seaweeds, and marine plants. Several rocky habitats in Southern California are widely isolated from other rocky areas by wide stretches of sand. This geographical isolation also results in reproductive isolation of certain organisms. In the event that a disturbance wipes out such an isolated shoreline, recovery of the organisms would be significantly delayed.

Many of the intertidal shorelines near large metropolitan areas of the Southern California mainland are subjected to intense usage by a recreation-oriented human population. This often excessive usage is in part responsible for decreased species diversity of intertidal organisms. However, a number of mainland intertidal habitats and most of the offshore island intertidal habitats have been shown to be extremely diverse.

Impacts on intertidal organisms from the selection of Alternative I-1 could occur as a result of oil spills. Damage to intertidal organisms usually results from the smothering effects of oil. Over the extent of the proposal, 3.3 oil spills greater than 1,000 bbl and 1.5 oil spills greater than 10,000 bbl are expected to occur as a result of exploration, production and transportation of resources following Southern California lease sales. Therefore, there is a high probability that low to moderate ecological losses would occur from oil spills at most rocky intertidal areas contacted by oil. These losses would result since most oiled organisms of the upper rocky shoreline will die. Although not all of the organisms within the intertidal communities would be killed, many individuals of a variety of species would be. The extinction of rare endemics could occur, but the likelihood is unknown.

Recovery of the damaged intertidal communities to a pre-disturbance structure will depend upon the vertical level of the intertidal zone impacted. The upper barnacle zone should require the least time for recovery (approximately

1 year). The more structurally-complex middle- and lower-levels would require the greatest time for recovery. Recovery time for communities within these areas will vary from over 1 year for certain seaweeds, up to 10 years for a mussel bed.

Although most rocky intertidal areas will sustain low to moderate ecological losses several unique rocky intertidal habitats exist within the Southern California planning area. These unique areas support dense populations of certain organisms found in other parts of the planning area. There is a high probability that a large oil spill will hit and impact the organisms in these areas resulting in high ecological losses. These areas are: 1) northwest coast of San Nicolas Island, 2) Santa Barbara Island, 3) southern coast of Santa Rosa Island and 4) San Clemente Island outer coast. Isolated rocky habitats on the mainland coast near Santa Barbara, Point Dume, Palos Verdes, and Newport Beach to Dana Point may be impacted.

The greatest long-term changes to rocky intertidal communities would result from several large oil spills hitting the same area every few years. However, the probability of this type of occurrence is low. These areas would sustain high ecological losses since their isolation would result in delayed recovery times.

Damage to sandy intertidal beach communities from oil spills will be a low ecological loss. The probability of this loss is high. Residence time of oil on sandy beaches is greater than rocky beaches, and this could delay recovery processes. In the event that oil is retained on a sandy intertidal beach for long periods, community members such as clams may suffer a high ecological loss. The extent of direct damage from large oil spills is not known, but it is not expected to result in the complete destruction of a particular community. Indirect damage could result from the cleanup operations following a large oil spill. These activities could result in the total destruction of local communities.

Impacts on rocky and sandy intertidal shorelines could also result from the installation of subsea pipelines. Damage to the communities within an area about 20 m wide would occur where the pipelines come ashore. Recovery from this type of disturbance should proceed normally. Such impact is considered to be low level. The probability of this impact is expected to be high.

It is expected that over half of the predicted resources for the Southern California planning area occur within the Santa Barbara Channel. Furthermore, most existing infrastructure in the planning area (60 out of 70 structures) occurs in this channel. Past spill model trajectories have forecast oil to flow toward the Channel Islands whose shores are primarily rocky. As a result, exploration, development, and production activities and associated impacts will tend to concentrate within the Santa Barbara Channel (refer to USDI, 1979; USDI, 1981).

Overall, the expected regional impacts on intertidal communities are low to moderate based on the number of oil spills predicted for the region.

Conclusions. There is a high probability that rocky intertidal areas will sustain low to moderate ecological losses. However, at several unusual

island habitats (northwest coast of San Nicolas Island, Santa Barbara Island, Santa Rosa Island and San Clemente Island outer coast), and at the small, isolated mainland habitats (areas in and around Santa Barbara, Point Dume, Palos Verdes, and Newport Beach to Dana Point) there is a high probability of high ecological losses.

There is a high probability that sandy beaches will sustain low ecological losses from oil spills. In the unlikely event that cleanup operations are undertaken, sandy beaches would sustain high ecological losses. Overall, the expected regional impacts on rocky and sandy intertidal communities are low to moderate.

Cumulative Impacts. In the unlikely event that all tracts offshore Southern California are leased and developed during the extent of the proposal (total resource development), the expected number of oil spills is 6.5 oil spills greater than 1,000 bbl and 3.1 oil spills greater than 10,000 bbl. Additionally, 12.6 oil spills greater than 1,000 bbl and 7.5 oil spills greater than 10,000 bbl are expected to result from import crude tankering to the region. An unknown number of spills are expected to occur from development of additional platforms, artificial islands, and/or subsea completion systems associated with continued hydrocarbon development in State Tidelands. The cumulative impact of these oil spills on rocky intertidal areas will be moderate ecological loss, except for certain sensitive habitats discussed above, where impacts would be high. The likelihood of this impact occurring is high.

The most likely impact on sandy beaches will be low. However, on sandy beaches with a gentle slope, large oil spills could result in moderate ecological loss. The likelihood of this event is high.

Intertidal habitats are also affected by other forms of disturbance, such as trampling by humans, discharges of domestic and industrial waste and smog. Over the life of the proposal (30 years), these disturbances, combined with those from oil and gas development, could result in increased ecological losses.

The proposal contributes less than 17 percent of the oil spills greater than 1,000 bbl, less than 14 percent of the spills greater than 10,000 bbl. Since oil spills from tankering and other non-OCS related impact agents are expected to have the greatest impacts on intertidal areas, the contribution of the proposal to cumulative impacts is considered low to moderate whether cumulative impacts include development of all resources offshore Southern California (total resource development) or only resources described for the alternative and non-OCS related projects and proposals.

Overall, the expected cumulative regional impacts on intertidal communities are moderate to high.

(2) Subtidal Benthos: The benthos of Southern California is extremely complex because of the topographic complexity of the region which consists of deep basins, ridges, slopes, canyons, and mainland and island shelves. The most productive and diverse soft bottom area of Southern California is the Santa Rosa-Cortes Ridge, followed by the mainland and

island shelves. Soft bottom organisms are important food for many fish species. In addition to these soft bottom areas, the Tanner and Cortes Banks and many smaller rock outcrops scattered throughout the region have important hard bottom communities. Tanner and Cortes Banks and a few other rocky areas contain the relatively rare purple coral. Nearshore, Southern California has large forests of giant kelp that serve as an important habitat for many fishes and invertebrates.

The nature of a soft bottom area under a permanent platform may be changed for a radius of from 10 meters to a maximum of 100 meters for at least the life of the platform. This is caused by organisms, especially mussels, that are attached to a platform and eventually fall off, creating a different bottom substrate beneath the platform. Soft bottom communities can also be impacted by drilling muds and drill cuttings. Within a maximum radius of 100 meters of a platform or rig, most of the benthic life will be buried from the drill cuttings and drilling muds. These sediments may be several feet thick directly below a platform with thickness decreasing away from the platform. The communities within sediment bottoms probably will recolonize after a period of time; however, this colonization may not be by organisms characteristic of the surrounding area. Recolonization will come both from within the buried sediments and from outside larval settlements. Impacts from drilling muds and drill cuttings are of shorter duration than permanent platforms and are probably of less consequence. However, the impacts occur concurrently as long as wells are drilled from the platform or about 13 years (1987 to 2000).

It is expected that there will be an additional 37 platforms added to the Southern California Bight as the result of this action. The impacts to the soft bottoms from the platforms and drilling muds and cuttings from 920 production wells will be moderate to high in the localized area of a maximum radius of 100 meters. Additional information on impacts from muds and cuttings are described in Section V.D.7.a.1)a)(1). Moderate impacts will occur on the bottoms which are recolonized by original species in addition to the organisms which fall from the platforms. Since the impacts probably will remain localized, even in the Santa Barbara Channel where approximately half the platforms will occur, the impact to the Southern California soft bottom benthos of the area will be low. Permanent platforms could also alter the communities of rocky bottoms, possibly for a radius of up to 100 meters. As with soft bottoms, impacts are caused by organisms falling from the platform structure.

The highest impacts from drilling muds and cuttings to hard bottoms will be in those areas where the currents are weak. Also see Section V.D.7.a.1)a)(1). In these areas the highest concentration of muds and cuttings will primarily pile up and settle at the drilling site. Where the cuttings and muds pile up, the composition of the bottom will become altered within a radius of from 10 meters to 100 meters of the platform or rig and most organisms will be buried. Because the bottom substrate may change following the discharge of muds and cuttings, recolonization will consist of species different than the original inhabitants. If the 37 platforms and associated drilling are not concentrated on a rocky bottom, the localized impacts will be moderate to high.

Concentrated platforms on an area such as Tanner or Cortes Bank or the rocky bottoms off Point Conception could alter the ecology of the entire hard bottom area, and a high ecological loss would result. While the likelihood for platforms to be concentrated on hard bottom reefs is low to moderate, the likelihood of platforms and associated drilling to occur on hard bottoms is moderate.

Impacts from a large oil spill, caused by smothering and toxic fractions of the oil, on soft bottom communities generally will be low. This will particularly be true at deeper bottoms where dilution of the oil will be greater before it reaches the communities on the bottom. There is a possible danger of mortality to more sensitive species, particularly microcrustaceans. The possibility also exists for the extinction of several endemic species which are so numerous within the Southern California Bight (Valentine, 1966). In shallow water, mortality to a portion of commercial invertebrates, e.g., crabs, sea urchins, clams, is possible, but the impacts will be low. While impacts from the expected 3.3 spills of greater than 1,000 bbl or 1.5 spills greater than 10,000 bbl will be low to the general soft bottom communities, very high impacts may occur to several endemic species. The likelihood of at least a portion of a spill reaching a soft bottom is high.

Impacts from oil spills on the subtidal hard bottom communities will generally be low. Although these impacts may be low, the destruction of unusually sensitive species, particularly microcrustaceans, or species endemic to the California Bight, is possible, although the likelihood is probably low. A high impact may occur if a species that has an important community function is destroyed on a particular reef or hard bottom area from an oil spill. The community may be significantly altered until the population of the impacted species is replaced by brood stock from other areas. Until ecological relationships on subtidal hard bottom communities are better understood, the likelihood of such an impact is unknown.

Impacts to the benthic community could be increased if more than one oil spill hits the same area before the benthic community had time to recover from a previous oil spill. Impacts under these circumstances could be raised to moderate or even high. Certainly, the probability of a high impact would be increased. The likelihood of multiple oil spill impacts to benthic communities is moderate. This is especially true in the Santa Barbara Channel where approximately half the oil development is expected to occur.

Some specific areas having hard bottom benthic assemblages that may be sensitive to oil operations or spills are: 1) the rocky outcrops off Point Conception which may contain unusual benthic assemblages due to the unusual location of the area at the division point of two biogeographic provinces; 2) Santa Rosa-Cortes Ridge, because of its unusual species such as *Vema hyalina*. *Vema* is known only to occur on cobble substrate at the present time; and 3) Tanner and Cortes Banks because of its highly productive community and coral population.

Little evidence exists that kelp is harmed by oil. Under extremely heavy repeated oilings, the reproductive biology of kelp may be interfered with, but this is speculative. The expected impact will be the mortality of many canopy associates which range from invertebrates through fish. Particularly

susceptible are probably the microcrustacea, especially mysids. Because of the rapid reproductive rate and short life cycle, the population of most of these associates should return to prespill levels within a year. The likelihood of at least a portion of a spill reaching a rocky bottom is high.

Pipelines may disturb soft bottoms for an area 20 meters wide along their axis. Anchors may also cause a disturbance from being dropped and pulled along the bottom when pipelines are being layed. The disturbance will not be continuous from pipeline to anchor, but will occur at a horizontal distance of 3 to 7 times the depth of the anchor (see Section V.D.7.a.2)b) also). Trenches and mounds which apparently can remain for over a year in certain soft bottoms result from this procedure. In bottoms consisting of coarser sediments, like sand, the mounds and trenches probably do not remain as long. Assuming the composition of the bottom sediments remains the same from the pipeline or anchor disturbance, impacts to the soft bottom communities should be low. The likelihood for pipelines to be layed on soft bottoms is high.

Pipelines transversing hard bottoms should cause disturbances of the same dimensions given above for soft bottoms. The impacts to hard bottoms will be moderate to high in the path of the pipeline. Attached organisms will be crushed by the pipelines or anchors and repopulation will have to come primarily from larval settlement. The time required for the community to recover to its original structure will be from 1 year for kelp to approximately 10 years for mussels. The likelihood for pipelines crossing over hard bottoms is high for the coastal kelp beds and moderate for deeper areas.

The reason for the concern comes from concentrated platforms on a reef or areally limited hard bottom area. The resulting high impact to the reef may cause a moderate alteration of ecological relationships on the region within which the reef is contained. If the Biological Stipulation which has been employed in past Pacific OCS sales is adopted for each Southern California sale, the impacts to special unique or sensitive benthic areas could be mitigated. This would result if platforms are prevented from locating on the unique area, as the result of the stipulation. Other mitigation measures which potentially reduce the opporturnity for spills may be employed to further reduce ecological loss.

As a result of all proposed activities discussed above, hard bottom communities are likely to sustain moderate to high ecological losses in the immediate vicinity of platforms, and moderate ecological losses near pipelines. Soft bottom communities are likely to sustain moderate ecological losses near platforms. In other areas, hard and soft bottom communities are expected to sustain low or no ecological losses. However, although unlikely, some hard bottom reefs could sustain high ecological losses if platforms are concentrated on a reef, or if a large amount of oil from one or more oil spills reaches bottom. Also, although unlikely, several endemics from soft and hard bottom communities could suffer very high ecological losses from oil spills. Overall, the expected regional impacts on subtidal benthos are low to moderate since impacts are likely to be restricted to the localized areas discussed above.

Conclusions. As a result of the proposal, hard bottom communities are likely to sustain moderate to high ecological losses in the immediate vicinity of platforms, and moderate ecological losses near pipelines. Soft bottom communities are likely to sustain moderate ecological losses near platforms. In other areas, hard and soft bottom communities are expected to sustain low or no ecological losses. Overall, the expected regional impacts on subtidal benthos are low to moderate.

Cumulative Impacts. Seventy-four platforms are predicted for total development of the resources in the Federal OCS Southern California planning area. Currently, there are 14 platforms on the Federal OCS and 9 within State waters (see Section V.D.7.a.1)c)(3). An unknown number of additional platforms may occur as a result of resource development in the State Tidelands. The cumulative impact of platforms and associated drilling muds and cuttings from total development will be low and localized except on certain unique hard bottoms, where the possibility of a high impact is moderate.

In the unlikely event that all tracts offshore Southern California are leased and developed during the life of the proposal (total resource development), the expected number of oil spills is 6.5 greater than 1,000 bbl. An additional 12.6 oil spills greater than 1,000 bbl are expected to result from import crude tankering to the region during that same 30-year period. An unknown number of spills are expected to occur from development in State Tidelands. The cumulative impact of these oil spills will depend upon their timing and the number of times the area is hit. If an area is hit only once or twice over a wide period, the most probable impact will be low. If an area is hit several times within a few years, a moderate to high impact to the benthos is very likely. The likelihood of the former possibility is high while the likelihood of the latter is probably moderate.

The proposal contributes less than 17 percent of the oil spills greater than 1,000 bbl, less than 14 percent of the spills greater than 10,000 bbl, and less than 38 percent of the platforms. Compared to the likelihood of cumulative impacts from oil spills, the contribution from the proposal is relatively minor whether cumulative impacts include development of all resources offshore Southern California (total resource development), or only resources described for the alternative and non-OCS related projects and proposals. The contribution from platform-related impacts from the proposal, however, is significant. This will particularly be true in the Santa Barbara Channel where approximately half the development is expected to occur.

Overall, the expected cumulative regional impacts on subtidal benthos are moderate to high. The reason for the concern comes from concentrated platforms on a reef or areally limited hard bottom area. The resulting high impact to a reef may cause a moderate alteration of ecological relationships on the region. The concern for a high impact comes from multiple platforms on more than a single reef or concentrated platforms on a hard bottom area of fairly large areal extent. This added area may cause an alteration of ecological relationships within the region that will last for over two years.

(3) Estuaries, Salt Marshes and Wetlands: Estuaries and salt marshes, hereafter designated wetlands, are critical areas of high productivity and contain distinct assemblages of fish, birds, invertebrates,

and plants. The estuarine intertidal and subtidal benthic community plays an important role in the overall ecology of an estuary. Any event which destroys a large proportion of this community in a bay will have a significant effect on other communities in the bay, such as fishes, birds, and even terrestrial mammals which depend upon salt marshes for feeding. Wetlands are critical habitats for many species during at least one stage in their life cycle; examples are the California halibut, staghorn sculpin, least tern, and California rail. In addition, wetlands have a high proportion of rare and endemic species. Geographic isolation has prevented easy genetic mixing. Repopulation or restoration, once a wetland is destroyed, is slow or impossible.

In California, wetlands are not as numerous as in other parts of the United States. Much of the estuarine environment has been severely altered or destroyed. The three relatively unaltered estuaries remaining within Southern California are Mugu Lagoon, Anaheim Bay, and Tijuana Estuary. The rest have already undergone high ecological losses, primarily from development projects, and some are not likely to be allowed to recover within the next 25 years. However, restoration projects are planned or underway for some estuaries. Additional information on impacts on wetlands is given in Section V.D.7. a.1)a)(1).

Oil from spills associated with OCS activity to wetlands is considered the primary impact agent. Once oil has entered a wetland, mortality will be due to smothering as well as toxicity of some fractions. Hypothermia after oiling may cause serious bird mortality. However, the long-term loss is due to incorporation of oil into the muds resulting in loss of habitat and destruction of the benthic community. Oil can be retained in the estuary for long periods of time due to slow flushing action and penetration into the sediments. Erosion in oiled substrates increases.

In the event a large spill enters a wetland and remains for several tide cycles, destruction could be manifest for more than 10 years. Endemic species may be eliminated permanently. The impacts of oil on wetlands could be high to very high. Dispersants may be used to speed weathering of the oil and reduce impacts. However, oil dispersants may have more harmful effects than the oil itself. In general, dispersants are not recommended for estuaries (Dye, 1980). In some instances, artificial restocking may facilitate restoration.

In Southern California 1.6 spills larger than 10,000 bbl and 3.3 spills larger than 1,000 bbl are expected during the life of the proposal. Approximately half of these are expected in the Santa Barbara Channel. At least one of the 10,000 bbl spills in Southern California is expected in the vicinity of a major wetland. The probability of the spill actually entering the wetland depends on the size of the opening to the estuary or marsh and containment capabilities. (See USDI, 1981 for a discussion of containment capabilities.) Containment of oil is expected to be 40 to 90 percent effective depending on the season. However, several of the larger wetlands have entrances greater than 100 meters wide and are difficult to protect. The probability of oil impacting a Southern California wetland is, therefore, low to moderate.

Onshore construction activities which involve any part of an estuary would cause high ecological loss to the part of the wetland involved. However, pipelines and platforms are not expected in the vicinity of the wetlands, and consequently, the likelihood of impacts are very low.

Overall, the expected regional impacts on wetlands are moderate. Estuaries are a limited resource and an impact from an oil spill could result in environmental alteration to the coastal ecology of a large coastal section. However, the probability of impact from a spill in the area of these estuaries is moderate.

Conclusions. Impacts to estuaries and marshes are expected to be high to very high should a spill enter the wetlands. However, the potential for an impact event actually occurring is low to moderate. Overall, the expected regional impacts on wetlands are moderate.

Cumulative Impacts. In the unlikely event that all tracts offshore Southern California are leased and developed during the life of the proposal, the expected number of oil spills is 6.5 spills greater than 10,000 bbl. An additional 12.6 oil spills greater than 10,000 bbl are expected to result from import crude tankering to the region. An unknown number of spills are expected to occur from development in State Tidelands. The cumulative impact of these oil spills is high to very high and the likelihood of a major spill entering an important wetland is high.

The proposal contributes less than 17 percent of the oil spills greater than 1,000 bbl, less than 14 percent of the spills greater than 10,000 bbl and, therefore, contributes a minor portion of the likelihood of the high to very high impact causing oil spills entering an estuary compared with cumulative impacts likelihood. This contribution would be small whether cumulative impacts include development of all resources offshore Southern California (total resource development), or only resources described for the alternative and non-OCS related projects and proposals.

Overall, the expected cumulative regional impacts on estuaries are high because the likelihood of spills entering more than one of the limited estuaries is at least moderate. The environmental alteration of the regional coastal environment probably would require over 2 years to return to normal. Locally, the expected impacts on estuaries are high to very high.

b) Commercial Fisheries

(1) Fish: The marine environment off Southern California is rich in fish life. Of the 562 species of coastal marine fishes known to occur in California, 485 species (87 percent) are found in Southern California waters. With the inclusion of all of the deep-sea fishes not counted above, the total number of species in Southern California actually exceeds 485. Less than one-sixth of California's coastal marine fishes are commercially harvested.

Over the life of the proposal, 3.3 oil spills greater than 1,000 bbl and 1.5 oil spills greater than 10,000 bbl are expected to result from Alternative I-1 Southern California sales. Oil spills can impact fish populations by

causing short-term acute impacts or long-term sublethal impacts. Since most oil remains at the surface, species which occur in the surface layer are the most vulnerable to impacts from oil. Many species have egg, larval and juvenile stages which inhabit the surface layer and are susceptible to oil. Also of concern are impacts to adults. If numerous sexually mature animals are killed by oil, both the size and reproductive potential of the population will be directly reduced. Thus, species whose adult stages are concentrated near the surface at the time of a large oil spill (e.g., Pacific bonito, jack mackerel, northern anchovy, California grunion) may be significantly impacted. There are too many variables to accurately predict these impacts, particularly in economic terms. However, based on available information (see discussions in Appendix 8 of the FEIS and Section V.D. 7.a.1)a)(1)), surface fish populations are expected to sustain low to moderate ecological losses (see definitions for Coastal Ecosystems at the beginning of Section V.D.) each time there is a major oil spill. Since the oil spills listed ave probably will not occur together, the combined effect of low to moderate ecological losses each time there is a major oil spill probably will result in an overall low to moderate ecological loss to surface fishes over the life of the proposal. Although unlikely, if one major oil spill follows another in the same area before the populations have recovered, surface fish populations probably would sustain moderate ecological losses. Since fish populations fluctuate dramatically under existing conditions, any decrease resulting from the proposed action probably will be difficult to detect.

Reduction in the population size of one species could affect other species in the food chain. For example, many species feed on northern anchovies. If the number of anchovies is substantially reduced, their predators may need to switch to another food source, if available, to survive. Consumption of this new food source could affect its population size as well. Conversely, reduction in the number of anchovies means the population size of the species it feeds on could increase. The marine food web is extremely complicated and it is not possible to assess how significant the reduction of one species due to the proposal will be to others. However, the fact that population sizes are interrelated needs to be recognized.

Man-made structures could impact fish populations if they disrupt habitat that is essential to the species. Disruption would be most likely during placement of a structure. Since the essential habitats of most species are not known, it is not possible to determine if any fish species will be impacted.

Several types of discharges and effluents could be released during OCS oil and gas activities. OCS Order No. 7 prohibits disposal of any waste materials into the ocean that will create conditions which will adversely affect aquatic life. Disposal of waste materials is regulated by the Environmental Protection Agency. Of concern are drilling mu"s because very little is known about their long-term, chronic impacts. There are indications that these muds could produce elevated trace metal concentrations in marine organisms and interfere with reproductive processes (see discussions in Appendix 8 of the FEIS and Section V.D.7.a.1)a)(1)). The impact that these elevated trace metal concentrations will have on fish popu"ations is unknown. Any potential impacts from drilling muds to this area could be avoided if drilling muds and cuttings are barged out of the area or ashore.

The proposal also could have beneficial impacts to fish populations. There is no doubt that production platforms and probably other offshore structures act as artificial reefs (Simpson, 1977). The population sizes of some species may actually be slightly increased by the presence of these reefs. Also, adverse impacts to commercial and sportfishing operations (see Sections V.D.7.a.2)b)(2) and f)) could result in less fish being caught allowing fish populations to increase.

As a result of all proposed activities discussed above, surface fish populations are expected to sustain low to moderate ecological losses. Overall, the regional impacts on fish are expected to be low since impacts from the proposal are expected to be restricted to a few species localized areas and, therefore, most fish species will not be impacted.

Conclusions. As a result of the proposal surface fishes (e.g., Pacific bonito, jack mackerel, northern anchovy, California grunion) are expected to sustain low to moderate ecological losses. Overall, the expected regional impacts on fish are low.

Cumulative Impacts. In the unlikely event that all tracts offshore Southern California are leased and developed during the life of the proposal (total resource development), the expected number of oil spills is 6.5 oil spills greater than 1,000 bbl and 3.1 oil spills greater than 10,000 bbl. An additional 12.6 oil spills greater than 1,000 bbl and 7.5 oil spills greater than 10,000 bbl are expected to result from import tankering of crude oil. An unknown number of oil spills are expected to occur from development in State Tidelands. Since more than 19.1 oil spills greater than 1,000 bbl are expected, it is probable that one large oil spill may follow another in the same area. Therefore, the cumulative impact of these oil spills on fish populations probably will cause moderate ecological losses to surface fishes.

Many fish populations, particularly those important to commercial and sport fishermen, also are stressed from natural oil seeps, sewage disposal (see discussion in Section V.D.7.a.1)a)), or fishing pressure. These stresses, particularly the harvesting of large numbers of fish, result in high ecological losses to several fish populations. Overall, the expected regional impacts on fish populations due to cumulative impacts is high.

The proposal contributes less than 17 percent of the oil spills greater than 1,000 bbl, and less than 14 percent of the oil spills greater than 10,000 bbl of the cumulative case but does not contribute significantly to the other impact agents discussed above. Since the non-OCS-related impact agents have the greatest impact on fish populations, the contribution of the proposal to cumulative impacts on these populations is low whether cumulative impacts include development of all resources offshore Southern California (total resource development), or only resources described for the alternative and non-OCS related projects and proposals. However, even this small increase in cumulative impacts is significant since fish populations are already very stressed.

(2) Commercial Fisheries: California is an important center for commercial fishing interests. In 1980, over 804 million pounds of fish and shellfish worth $323 million to commercial fishermen were landed in

California (U.S. Dept. of Commerce, 1981a). This represents one-seventh of all landings in the United States. About three-fourths of the California landings were into Southern California ports. The total value of the California commercial fishing industry is over $1 billion due to the contributions of the support, processing, transportation, and marketing industries.

Over the life of the proposal, 3.3 oil spills greater than 1,000 bbl and 1.5 oil spills greater than 10,000 bbl are expected to result from Alternative I-1 Southern California sales. If fish or invertebrate populations decrease due to impacts from oil spills or other impact agents (see discussions in Sections V.D.7.a.2)a) and b)(1)), the commercial fishing industry could sustain low economic losses since there would be a loss in potential catch. These potential impacts are expected to be short term in duration, but could last several years in the unlikely event that one major oil spill follows another in the same area before the populations have recovered.

A large oil spill could impact commercial fisheries by causing a reduction in fishing space and time. It is unlikely that commercial fishermen will harvest in the area of an oil spill because: 1) their boats and gear may be contaminated, 2) they may be confined to port by oil containment booms, and 3) direct coating and incorporation of petroleum hydrocarbons can cause tainting of marine organisms, rendering them undesirable or unmarketable. A large oil spill in prime fishing grounds probably would cause short-term moderate to high economic impacts by precluding fishing. Although unlikely, if one major oil spill follows another in the same prime fishing grounds, short-term high economic impacts to the commercial fishing industry probably would result.

A large oil spill could have a short-term low to moderate economic impact on kelp harvesters since oil may affect kelp reproduction (see Section V.D.7.a. 2)a)) and because kelp traps oil rendering it unsuitable for harvest. During the 1969 Santa Barbara oil spill, the impact on kelp harvesting was negligible because it was possible to reschedule the planned harvest to a later month of the year by which time oil in the kelp beds had been dispersed by natural wave action (Mead and Sorensen, 1970). However, since it is not always easy to reschedule planned harvests, the kelp harvesting industry may sustain short-term low to moderate economic impacts if oil reaches kelp harvesting areas. Information on the value of the kelp harvesting industry is unavailable due to the relatively small size of this industry.

None of the mariculture industries are anticipated to be impacted since the probability of an oil spill reaching them is very low. However, if a large oil spill reaches mariculture operations, they would be impacted similarly to other commercial fisheries. The organisms would not be marketable due to tainting even if they lived through an oil spill. Equipment coated with oil would need to be replaced. Additionally, since they have less mobility than other fishermen, mariculture farmers could be forced out of business.

As a result of the proposal, 37 platforms are estimated for the Southern California planning area. Platforms can result in lost fishing space, time, and gear. The fisheries most likely to have significant conflicts with these offshore structures are the commercial trawl fisheries, but purse seining may have some conflicts (see discussion in Centaur Associates, Inc., 1981). In general, a maximum radius of 1,320 feet may be lost around all structures if

fishermen choose to observe the payment criteria of the Fishermen's Contingency Fund (see Section I.B.5 of the FEIS). Multiplying the number of platforms (37) predicted for the Southern California planning area times the area that would be lost by a 1,320-foot radius buffer zone (50.8 hectares) and dividing by the total planning area (7.7×10^6 hectares) yillds a 0.02 percent loss (1.9×10^3 hectares) in fishing area. Therefore, the total fishing area that will be lost throughout the planning area will be very small. However, over half of the platforms probably will be placed in the Santa Barbara Channel. Since most trawling within the Southern California Bight occurs in the Santa Barbara Channel, it is likely that several platforms will be placed within prime trawling grounds. Loss of fishing space and time from placement of platforms in prime trawling grounds probably will cause moderate economic losses to the $5 million commercial trawl fishing industry in this area.

At the same time, platforms can provide benefits as navigational aids and places to obtain emergency help in case a vessel is disabled or a crewman injured, and platforms could be used for mariculture operations (particularly for growth of mussels and abalones). There is no doubt that production platforms and probably other offshore structures act as artificial reefs (Simpson, 1977). However, this most likely will have a slight impact on most fish populations and may not benefit fishermen since oil companies generally discourage fishermen from anchoring or otherwise floating next to a platform.

Most if not all platforms will have one or more associated pipelines. Until recently, pipelines in Southern California have created very few problems for commercial fishermen. However, commercial trawl fishermen have not been able to fish a 12-square-mile area as a result of pipelaying activity in the Santa Barbara Channel in 1979. Fishermen can no longer trawl this area because their nets hang up on mud mounds and trenches created by anchors from the pipeline lay-barge. Although OCS Order No. 9 requires that pipelines be installed and maintained to be compatible with commercial trawl gear, attempts to restore the area have not been successful. Additionally, it is not clear what needs to be done differently in the future to avoid the problem. However, based on available information, loss of fishing space and time from mud mounds and trenches created during placement of pipelines in important trawling areas is expected to cause high economic losses to the $5 million commercial trawl fishing industry in the Santa Barbara Channel.

Other subsea structures which potentially can cause significant conflicts are debris and temporarily abandoned subsea wellheads (also called temporary abandonments and casing stubs). Fishermen often do not know they exist and, therefore, they cannot avoid these objects. However, existing mitigation reduces these conflicts. Also, the Fishermen's Contingency Fund (see Section I.B.5 of the FEIS) will compensate for some losses resulting from these structures.

Onshore, competition between the oil and gas industry and commercial fishing industry can occur for berthing spaces and services. The significance of these impacts will depend on the port. Centaur Associates, Inc. (1981) has conducted a study for BLM on port conflicts. These conflicts are not expected to be significant in Southern California.

Vessel traffic will cause some conflicts with commercial fishing boats. A minor impact will be caused by supply and crew boats since fishermen will need to maneuver around them if these vessels cut across the fishermen's intended path. In foul weather, additional vessels traveling through an area can become a significant hazard, particularly if they do not maintain safe speed levels. The greatest vessel conflicts probably will be with seismic boats. Fishermen have noticed that after a seismic boat passes through the area, sonar shows that the fish move to the ocean bottom and subsequently no fish are caught. How long the fish remain on the bottom and the significance of this observation are unknown. Additionally, seismic boats pull a 2-mile long cable behind them that precludes fishing in the area while seismic work is being conducted. This cable also can become entangled with stationary fishing gear, resulting in disruption and potential loss of the fishing gear. This conflict could be reduced if the fishermen receive adequate notice of specifically where the seismic boats will be working so that the gear can be removed or its location can be clearly identified. If this conflict is not reduced, seismic boats may temporarily cause moderate to high economic impacts to the $1 million commercial crab fishing industry. Partial reimbursement for gear damage is available from the Fisherman's Protection Act which is described in 50 CFR 258 (see the Federal Register, Vol. 44, No. 208, pages 61546-61551, October 25, 1979, and Vol. 45, No. 53, page 17018, March 17, 1980).

As a result of all proposed activities discussed above, the commercial trawl fishing industry in the Santa Barbara Channel is expected to experience high economic losses, and the commercial crab fishing industry is expected to temporarily experience moderate to high economic losses. Other commercial fisheries are expected to sustain short-term moderate to high economic losses. Since impacts from the proposal are expected to be restricted to short-term losses for most fisheries and some fishermen can switch to a different fishery, the overall expected regional impacts on the commercial fishing industry are moderate. If the Wells and Pipeline Stipulation employed in specific cases in past Pacific OCS sales is adopted for each Southern California sale, the potential for fishing conflicts will be reduced slightly. The adoption of additional discretionary mitigation measures which reduce the probability of spills would slightly decrease the likelihood of the ecological losses described above.

Conclusions. The commercial trawl fishing industry in the Santa Barbara Channel is expected to experience high economic losses primarily due to loss of fishing space created by platforms and pipelaying activities. The commercial crab fishing industry is expected to temporarily experience moderate to high economic losses primarily due to loss of gear or fishing space created by seismic vessels. Other commercial fisheries are expected to sustain short-term moderate to high economic losses primarily due to loss of fishing space and time created by oil spills. Overall, the expected regional impacts on the commercial fishing industry are moderate.

Cumulative Impacts. In the unlikely event that all tracts offshore Southern California are leased and developed during the life of the proposal (total resource development), the expected number of oil spills is 6.5 oil spills greater than 1,000 bbl and 3.1 oil spills greater than 10,000 bbl. An additional 12.6 oil spills greater than 1,000 bbl and 7.5 oil spills greater

than 10,000 bbl are expected to result from import tankering of crude oil. An unknown number of oil spills are expected to occur from development in State Tidelands. Since more than 19.1 oil spills greater than 1,000 bbl are expected, it is probable that one large oil spill may follow another in the same area. Therefore, the cumulative impact of these oil spills on commercial fisheries is expected to cause low economic impacts for several years due to impacts on fish and invertebrate populations, and short-term high economic losses due to preclusion of fishing. Although unlikely, if several major oil spills occur in the same area, high economic impacts on the commercial fishing industry could last several years.

Seventy-four platforms are estimated for this area with all Federal OCS resources developed. Currently, there are 15 oil and gas structures (platforms, OS&T) on the Federal OCS and 55 structures (platforms, artificial islands, subsea completion systems) in State waters (see Section V.D.7.a.1)c)(3)). An unknown number of additional structures may occur as a result of resource development in State Tidelands. The total fishing area that will be lost throughout the planning area from these structures probably will be very small. However, since many of the existing structures are in the Santa Barbara Channel, the commercial trawl fishing industry in this area is expected to experience high economic losses. Additionally, several pipelines probably will be constructed from existing leased tracts. Since some of these pipelines probably will be placed in important trawl grounds, it is likely that the cumulative impacts of mud mounds and trenches also will create high economic impacts to the commercial trawl fishing industry in the Santa Barbara Channel area.

Vessel traffic from existing and future oil and gas activities, particularly seismic boat traffic, may create moderate to high impacts to the commercial crab fishing industry. The impacts of debris, temporarily abandoned subsea wellheads, and use of ports and harbors associated with total development of oil and gas resources offshore Southern California (Federal and State) are not expected to be significantly different from the impacts described above for the proposal.

The commercial fishing industry also is stressed for other reasons such as fluctuations in fish populations, changes in market conditions, and restrictions on fish harvests. These other sources may cause high economic impacts to the industry. Overall, the expected regional impacts on commercial fisheries due to cumulative impacts is high.

The proposal contributes less than 17 percent of the oil spills greater than 1,000 bbl, less than 14 percent of the oil spills greater than 10,000 bbl, less than 38 percent of the platforms and pipelines, and perhaps one-third of the oil and gas vessel traffic, but does not contribute significantly to the other impact agents discussed above. Since the non-OCS-related impact agents have the greatest impact on commercial fisheries, the contribution of the proposal to cumulative impacts on these fisheries is low whether cumulative impacts include development of all resources offshore Southern California (total resource development), or only resources described for the alternative and non-OCS related projects and proposals. However, even this small increase in cumulative impacts is significant since commercial fisheries are already very stressed.

c) Endangered and Threatened Species

(1) Endangered Species: Seven federally listed endangered whale species are known to occur within the waters of the Southern California Bight (SCB). Those sighted during the study by The Center for Coastal Marine Studies (1980) include the blue, gray, finback, humpback, sei (all baleen whales), and sperm whales (toothed whales). A Pacific right whale has also been sighted (USDI, 1981). See Section V.D.7.a.2)d)(3), Marine Mammals, for a discussion of impact agents and levels on whales.

California brown pelicans breed on the West Anacapa Island. This represents the northern end of its present range. California least terns are being reestablished on sandy beaches along the California coast. The light-footed clapper rail occurs in selected salt marshes and estuaries. Rails are known to be very susceptible to habitat destruction.

Two species of endangered raptors, the American peregrine falcon and the bald eagle, have occurred along the California coast and on the Channel Islands. The bald eagle has recently been reintroduced to Santa Catalina Island. A few nesting peregrine falcons occur in Northern and Central California. At present, peregrines occupy the Southern California area on a seasonal basis only.

Three species of sea turtles, the leather-backed, green sea and loggerhead, are ocassional visitors in SCB waters. The loggerhead is threatened, the other two, endangered. These appear to be occasional visitors rather than breeding animals.

Vema hyalina, a benthic monoplacaphoran mollusk, has been nominated as an endangered species.

Six species of endangered plants occur on the Channel Islands or in coastal estuaries (see USDI (1981) for a detailed list). All of these species occur above high tide line and are not expected to be impacted.

Additional California endangered species are not included here since the United States Fish and Wildlife Service in its Sale No. 68 FEIS (USDI, 1981) consultation considered they would not be implicated in Southern California OCS activities.

Over the life of the proposal, production of the estimated 0.9 billion bbl of oil is expected to result in 3.3 oil spills greater than 1,000 bbl and 1.5 oil spills greater than 10,000 bbl from the three Southern California sales, with more than half of those spills expected in the Santa Barbara Channel. Chances of two spills occurring in an area due to the proposal are very low. Likelihood of at least one spill occurring at some time during the proposal and hitting part of the Northern Channel Islands or areas of cetacean migration are high. The chance of a spill hitting Anacapa Island or any one particular area in the channel is low.

In addition to oil spills, 37 platforms are predicted under this proposal. More than half of these are expected to occur in the Santa Barbara Channel.

Impacts of this proposal on the great whales are discussed in Section V.D.7.a.2)d)(3), Marine Mammals. Whales have a high likelihood of a low to moderate impact from oil and a moderate likelihood of a moderate impact from the noise associated with exploration and production.

Impacts from oil to the brown pelican are potentially high especially if juveniles are present; however, likelihood of an impact is low. (See Section V.D.7.a.2)d)(4) for a discussion of possible impacts to seabirds such as the brown pelican.

The probability of an oil spill reaching Santa Catalina Island and impacting the bald eagle is low. The bald eagles are currently foraging on land rather than in coastal or OCS waters. Should the eagle begin foraging in island waters, the impacts could be very high due to oiling. Impact levels to peregrines should also be low because it is unlikely that more than one or two birds would have the possibility of feeding on oiled seabirds and thus sustaining an impact.

Sea turtles become heavily oiled and could die if they contact a spill. However, the probability of an oil spill contacting more than one of these occasional visitors is low. The expected ecological impact level is therefore low with a moderate likelihood. Birds that inhabit the salt marshes are potentially the most seriously impacted due to low population levels and the sensitivity of the habitat. Least terns teach their young to fish and rails are totally dependent on the shallow marshes. The probability of an oil spill contacting salt marsh habitats used by the least tern or light-footed clapper rail is probably low to moderate for this proposal due to diversion techniques available to the Coast Guard and the narrow mouths of several of the estuaries. If an oil spill should come ashore between San Diego and Oceanside, the impacts to the endangered salt marsh bird species could be high or very high for that population.

Multiple spills in the same area during the life of the proposal could elevate significant impacts at least one level (example; from moderate to high) due to the inability of a population to recover before a second event.

For a discussion of the impacts of noise and drilling effluents on cetaceans and seabirds, see Sections V.D.7.a.2)d)(3) and I.D.7.a.2)d)(4). The impacts of noise and disruption on brown pelicans could be very high if drill rigs or human disruption were to occur near the nesting colonies. The likelihood of this is considered low. Estuarine species should not suffer noise impacts. The impacts from drilling effluents are uncertain.

If a spill occurs, mechanical cleanup equipment may be used to reduce oil impacts somewhat. Dispersants may also be used to speed weathering of the oil and reduce impacts. However, oil dispersants may have more harmful effects on endangered species than the oil itself (Dye, 1980). Overall, the great whales are expected to suffer moderate impacts. Other species are expected to suffer low or very low impacts. The high potential impacts discussed above are not likely to occur.

Conclusions. As a result of the proposal, whales are likely to sustain moderate ecological impacts, and other endangered species are not expected to be impacted. However, although, unlikely, the least tern, light-footed clapper rail, and brown pelican may sustain high ecological losses, and other endangered species may sustain low ecological losses. Overall, the expected regional impacts on endangered species are moderate.

Cumulative Impacts. In the unlikely event that all tracts in the Southern California OCS are leased and resources developed within the life of the proposal, the expected number of spills greater than 1,000 bbl is 6.5 from Federal OCS and 3.1 greater than 10,000 bbl. The number of spills from import crude tankering are 12.6 and 7.5. If projected spills from tankering are added, within the life of the proposal the resulting respective number of spills would be 19.1 and 10.6. (Natural seepage at Coal Oil Point varies from 30-600 bbl per day. The Santa Barbara spill in 1969 was estimated by USGS to be about 70,000 bbl). The State of California is also expected to continue development of its lands. It is assumed some platform placement and oil spills will result from resource development in State Tidelands. In addition to oil from spillage, endangered species are possibly stressed by sewage outfalls and natural seeps. If pollution levels remain constant or increase, some species may suffer low-level impacts from several sources and a general degradation in health is possible. That is, some individuals may die but the species is expected to maintain a viable population. However, other species such as the light-footed clapper rail and the least terns may suffer very high impacts, becomming effectively extinct with or without the proposal. This is primarily due to the sensitivity of the habitat (salt marshes) and the low population levels as both are affected by increasing urbanization and oil spills. Therefore, the overall regional impacts are expected to be very high to endangered species.

The proposal contributes less than 17 percent of the oil spills greater than 1,000 bbl, less than 14 percent of the spills greater than 10,000 bbl and less than 38 percent of the platforms. The proposal will also contribute to drilling effluents. The proposal does not, however, contribute significantly to other pollution levels such as sewage. Since platforms are significant impact agents on endangered whales, the proposal may substantially increase cumulative impacts on this resource category whether cumulative impacts include development of all resources offshore Southern California (total resource development), or only resources described for the alternative and non-PCS related projects and proposals. The remainder of the endangered species are expected to sustain low additional impacts from this proposal.

(2) Threatened Species: The loggerhead turtle is discussed under Endangered Species.

The southern sea otter is sighted occasionally along the Southern California Coast but is not breeding in the area at this time. The expected impacts on the southern sea otter are low. However, there is a low probability of a moderate impact since it is possible spills from the Santa Barbara Channel may hit non-breeding portions of the Central California sea otter population. See Section V.D.8.a.2)c)(2) for a summary of impacts to the southern sea otter in Central and Northern California. It is also possible the sea otter will expand its range into Southern California during the life of the proposal. Impact levels to sea otter colonies, if breeding females are present, would

then be the same as discussed for Northern California. However, due to the unknown location of a potential colony(ies), the likelihood is uncertain.

The guadalupe fur seal is classified as rare by the State of California. It uses the SCB for nonbreeding purposes, hauling out on San Miguel Island. The expected impacts on the guadalupe fur seal are low, however, it could sustain moderate impacts if oiled. Impacts of oil would be similar to those discussed in Section V.D.8.a.2)d)(3) for the northern fur seal. Hypothermia and loss of buoyancy would cause death to some nonbreeding individuals. Of the expected 3.3 spills greater than 1,000 bbl and 1.5 greater than 10,000 bbl resulting from development from Alternative I-1 in Southern California, over half are expected to occur in the Santa Barbara Channel. However, the likelihood of a spill contacting the guadalupe fur seal on San Miguel Island is considered low.

Conclusions. Threatened species are expected to sustain low ecological losses. However, although unlikely, the Southern sea otter and the guadalupe fur seal may sustain moderate ecological losses. Overall, the expected regional impacts to Southern California threatened species are low.

Cumulative Impacts. Cumulative impact agents for threatened species are the same as those discussed in the above Section V.D.7.a.2)c)(1), Endangered Species. The overall cumulative impacts on threatened species are expected to be low to moderate.

Since oil spills from tankering and other non-OCS related impact agents are expected to have the greatest impacts on threatened species, the contribution of the proposal to cumulative impacts is considered low to moderate whether cumulative impacts include development of all resources offshore Southern California (total resource development) or only resources described for the alternative and non-OCS related projects and proposals.

d) Habitats and Resources of Special Concern

(1) Marine and Estuarine Sanctuaries: The Channel Island National Marine Sanctuary extends for 6 miles around the northern Channel Islands in the Santa Barbara Channel. It contains some highly productive waters and bottom communities, including an area of purple coral. Because of the high productivity, sanctuary waters are important for forage by the many important biological communities and species of the area. The sanctuary surrounds the largest pinniped rookeries in California, as well as important bird nesting areas, including the endangered brown pelican.

Impacts to these species and communities from oil and gas operations will be the same as those discussed under the appropriate biological resources in Section V.D.7.a.2). The biological resources which would be impacted by oil spills, either from smothering, oil toxicity, or fouling include seabirds, pinnipeds, intertidal and subtidal benthic organisms. The severity of impacts on the groups are found in the appropriate sections under V.D.7.a.2). The most probable ecological loss will be low to moderate; although, if multiple spills occur, closely placed in time, there is a possibility of a high impact. The probability of a hit from an oil spill on one or more of these resources is high, largely because approximately half of the operations

will occur in the Santa Barbara Channel. Vessel traffic, human intrusion and noise generated during exploration and development may affect seabirds and marine mammals. These resources in the marine sanctuary are expected to sustain low to moderate ecological losses from these activities.

There is a regulatory review being conducted by NOAA to be completed in March, 1982 regarding the leasing and development of tracts within the sanctuary. If drilling is allowed within the sanctuary, impacts resulting from drill cuttings and muds on hard bottom communities within the sanctuary is possible. The impacts resulting from this will generally be low to moderate for the general area but moderate to high in the immediate vicinity of the platform. If the NOAA findings permit drilling within the sanctuary it is very likely the oil industry will take advantage of this opportunity. The likelihood of an impact from muds and cuttings would then be high.

Overall, the expected regional impacts on the marine sanctuary from all activities discussed above are moderate. As indicated several times in this section, there is a high likelihood spills originating in the Santa Barbara Channel will hit the Channel Islands within the sanctuary. If drilling is allowed within the marine sanctuary and the Biological Stipulation employed on specific tracts in recent Pacific area sales is invoked, potential impacts can be reduced by ensuring that drilling will be moved from a biologically sensitive benthic area to a more favorable location. The adoption of additional discretionary mitigation measures which potentially reduce the probability of oil spills would slightly decrease the likelihood that sanctuaries would sustain the ecological losses described above.

Conclusions. Impacts resulting from the proposal could affect the character of the Channel Islands National Marine Sanctuary by impacting seabird, pinniped, intertidal and subtidal benthic resources. The most probable ecological loss from all activities will be moderate, although the potential for a high ecological loss exists. Minor interference with recreational boating, fishing, diving, and cultural resources also could occur. Impacts to specific resources are covered more fully in the appropriate sections in V.D.7.a.2). The likelihood of these impacts occurring is high.

Overall, the expected regional impacts on the Channel Islands National Marine Sanctuary are moderate.

Cumulative Impacts. In the unlikely event all tracts offshore Southern California are leased and developed during the life of the proposal, the expected number of oil spills is 6.5 greater than 1,000 bbl and 3.0 greater than 10,000 bbl. An additional 12.6 oil spills greater than 1,000 and 7.5 greater than 10,000 bbl are expected to result from import crude tankering to the region. An unknown number of spills are expected to occur from development in State Tidelands.

The additional spills will increase the severity of impacts due to the probability of repeated spills impacting an area before the biota has a chance to fully recover. The likelihood of spills reaching the marine sanctuary is moderate. Also see Section V.D.7.a.2).

Moderate to high ecological losses from State and Federal offshore hydrocarbon development are therefore likely for several of the most important resources within the Channel Islands National Marine Sanctuary; specifically, seabird and pinniped populations. The diving seabird (for example, cormorant) and fur seals are most vulnerable. However, most seabird and pinniped species using this area will probably be affected. To a lesser extent, intertidal and subtidal benthic resources are also likely to be deleteriously impacted. Additionally, the key characteristics of the Northern Channel Islands, which were primary factors in having the area designated a marine sanctuary (and a national park) could be significantly affected by cumulative impacts.

The proposal contributes less than 17 percent of the oil spills greater than 1,000 bbl, less than 14 percent of the spills greater than 10,000 bbl. Since oil spills from tankering and other non-OCS related impact agents are expected to have the greatest impacts on the marine sanctuary, the contribution of the proposal to cumulative impacts is considered low to moderate whether cumulative impacts include development of all resources offshore Southern California (total resource development) or only resources described for the alternative and non-OCS related projects and proposals.

Overall, the expected cumulative regional impacts on the marine sanctuary are moderate to high because of the large number of expected spills, many of which may reach the marine sanctuary.

(2) Designated Areas of Special Concern: There are three types of designated areas of special concern which are of biological importance. They are: 1) ecological reserves, 2) marine life refuges, and 3) area(s) of special biological significance (ASBS). These are legally defined and controlled by the State of California. Ecological reserves and marine life refuges are very similar; however, there are more restrictions and controls in an ecological reserve. The purpose of the refuges and reserves is to reduce the abuse and waste of the State's tidepool resources by restricting general collecting of all animals living in tide pools and other areas between the high tide mark and 1,000 feet below the low tide mark. ASBS are also designed to protect intertidal and shallow subtidal areas. They are areas containing biological communities of such extraordinary, even though unquantifiable value that no acceptable risk of change in their environments as a result of man's activities can be entertained. From Point Conception to the U.S.-Mexican Border, there are seven ecological reserves, nine marine life refuges and fifteen areas of special biological significance.

Oil spills would cause impacts on the shallow subtidal and intertidal areas to the extent that is discussed in Section V.D.7.a.2)a)(1) and (2). These impacts are expected to be low for the shallow subtidal areas and low to moderate for the intertidal areas. This conclusion is primarily based upon the large Santa Barbara oil spill (Straughn, 1970 and Foster, et al., 1971) where the impact to the intertidal was moderate. There is an expected 3.3 spills of greater than 1,000 bbl and 1.5 greater than 10,000 bbl as the result of the proposal. The probability of a spill hitting one or more of these designated areas is high. This is particularly so because approximately half the development will occur in the Santa

Barbara Channel and because of the high probability of a hit on at least one of the Channel Islands (all ASBSs) forecast by previous impact statements (USDI, 1979; USDI, 1981a).

Impacts to the special designated areas could come from pipelines. However, with the high degree of concern placed upon these areas by the State of California, it is highly unlikely that pipelines would be allowed to transverse them.

Overall, the expected regional impacts on designated areas of special concern are low except for the islands of the Santa Barbara Channel where expected impacts are moderate. An impact to these islands could alter the ecological relationships within the Santa Barbara region.

Conclusions. It is likely that at least one designated area of special concern in the Santa Barbara Channel will sustain low ecological losses in the shallow subtidal and low to moderate ecological losses in the intertidal.

Overall, the expected regional impacts on designated areas of special concern are low to moderate.

Cumulative Impacts. In the unlikely event that all tracts offshore Southern California are leased and developed during the life of the proposal, the expected number of oil spills greater than 1,000 bbl is 6.5. An additional 12.6 oil spills greater than 1,000 bbl are expected to result from import crude tankering to the region. An unknown number of spills are expected to occur from development in State Tidelands.

The likelihood of an impact occurring in one of the designated areas of special concern will be increased. The likelihood of impacts was already high before cumulative impacts were included for consideration. Increased severity to the shallow subtidal and intertidal will primarily depend upon the number and frequency of hits on a particular intertidal area as discussed in Section V.D.7.a.2). Impacts caused from multiple oil spills will be high for intertidal areas and moderate for subtidal areas. The likelihood of these impacts occurring will be moderate.

The proposal contributes less than 17 percent of the oil spills greater than 1,000 bbl, less than 14 percent of the spills greater than 10,000 bbl and, therefore, contributes a low to moderate portion of the cumulative impacts whether cumulative impacts include development of all resources offshore Southern California (total resource development), or only resources described for the alternative and non-OCS related projects and proposals.

Overall, the expected cumulative regional impacts on designated areas of special concern are moderate to high.

(3) Marine Mammals: The waters of the Southern California Bight (SCB) support populations of over 30 species of marine mammals. More than 75,000 pinnipeds (seals and sea lions) and a similar number of cetaceans (whales, dolphins, and porpoises) are present. The SCB is at the periphery of the ranges of many species. It is a zone of overlap for faunas characteristic of temperate/subarctic and subtropical waters.

Five pinniped species breed and rear their young on the Northern Channel Islands, producing about 20,000 young each year. Forty percent of the world's population of California sea lions and northern elephant seals breed on the Channel Islands. The only northern fur seal colony outside of Alaska is on San Miguel Island.

Cetacean reproductive patterns in the SCB are not well understood. Young of seven species were seen in the Bight from 1975 to 1978. The gray whale and northern right whale and dolphin were among those species sighted with young. The waters of the SCB are also important because they are part of the coastal migration route of much of the world's entire California gray whale population and the offshore routes of the North Pacific stocks of the blue, humpback, and fin whales. Common dolphins, bottlenose dolphins, and pilot whales are year-round residents (Center for Coastal Marine Studies, 1980).

Over the life of the proposal, production of the estimated 0.9 bbl of oil is expected to result in 3.3 oil spills greater than 1,000 bbl and 1.5 oil spills greater than 10,000 bbl are expected to result from the Southern California sales; more than half of these are expected in the Santa Barbara Channel near the Northern Channel Islands. Chances of at least one spill occurring at some time during the proposal and hitting part of the Channel Islands or areas of cetacean migration are high. Chances of a spill hitting any one particular area in the Channel are low. Oil spills could impact marine mammals in a number of ways. A spill in the vicinity of seasonally reproducing pinnipeds could have moderate impacts due to feeding disruption, eye and skin irritation and human intrusion during cleanup. Northern fur seals breed on the Northern Channel Islands and are particularly sensitive to oil contact, losing sufficient heat and buoyancy to result in death. The impact to these animals could be very high locally. With the exception of the fur seals and breeding animals, there are no known serious impacts to pinnipeds from oil.

Substantiated serious impacts to cetaceans from oil are also not known at this time. Fresh oil that is swallowed may be somewhat toxic to all whales. There is also evidence that oil fouling of the baleen plates of the great whales, including the gray, blue, fin, and sei, may temporarily reduce feeding efficiency. The whales may sustain low to moderate impacts if oil is engulfed. (See appropriate sections of USDI, 1981 and National Academy of Sciences, 1975 for a more detailed discussion of oil impacts. An update of the National Academy Report should be published in 1981 or 1982.)

The southern sea otter has not expanded its breeding range into the SCB at this time. A few nonbreeding sea otters are occasionally sighted on the Southern California Coast. For a discussion of oil impacts on sea otters, see Section V.D.8.a.2)d)(3). For a discussion of impacts on sea otters should a spill occur in Southern California, see Section V.D.7.a.2)c)(2). The guadalupe fur seal is discussed under Threatened Species, Section 7.a.2)d)(2).

Multiple spills in the same area during the life of the proposal could elevate significant impacts at least one level (example: from moderate to

high) due to the inability of a population to recover before a second event. However, chances of two spills in an area due to the proposal are very low.

If a spill occurs, mechanical cleanup equipment may be used to reduce oil impacts somewhat. Dispersants may also be used to speed weathering of the oil and reduce impacts. However, oil dispersants can have more harmful effects on marine vertebrates than the oil itself (Dye, 1980).

Noise pollution from seismic activity, drilling and pipelaying, aircraft and normal platform activities may disrupt normal behavior in some of the marine mammals. Possible noise avoidance behavior has been demonstrated by the gray whale and may occur in other cetaceans. Other cetaceans use sound for echo location, communication and possible stunning or killing of prey species. Large numbers of platforms, as predicted for the Santa Barbara Channel, may force cetaceans to use migratory routes with less favorable food resources. There could be a moderate ecological impact to endangered whales and a low to moderate ecological impact to other cetaceans due primarily to the longevity of the impact. Noise can also temporarily frighten seals and sea lions from rookeries causing infant mortality. The potential for a high impact exists. However, necessary periods of high noise level should be relatively short and infrequent. If care is taken by aircraft pilots and off-duty crews to avoid disrupting rookeries, the number of high noise impacts on marine mammals should be low.

Drilling muds have been considered a possible source of rare metals which could be toxic in sufficient quantities. Formation effluents may also contain rare metals. Current information, however, indicates rare metals from these sources are not biologically available. In addition, bottom sediments disrupted during drilling may contain deposits of other contaminants such as hydrocarbons and DDT previously discharged into ocean waters. Available data on the bio-accumulation of toxic materials in marine mammals and other marine vertebrates is inconclusive. The presence or absence of long-term chronic impacts is uncertain. There is a 100 percent probability of drilling effluents occurring. However, dilution in the water column should keep the impacts low. (See Section V.D.7.a.1)a)(1) for a more detailed discussion of effluents.)

Many potential effects of offshore drilling and production on marine mammals have not been studied (Geraci and St. Aubin, 1979). Most of these animals live and reproduce in the ocean or on islands and remote parts of the coastline, and do not do well in captivity; thus, their biology is not well known. Information is still being gathered on such basic aspects of their life history as food variability, reproductive age, and frequency of births. There have been few detailed studies of parasites (internal and external), microfauna, mechanisms of immunity, disease, effects of stress, and behavior. Therefore, the impacts from chronic low levels of petroleum hydrocarbon pollution and continued drilling activities on these long lived species is uncertain.

Overall, the regional impact to marine mammals is expected to be moderate due to the moderate impacts to cetaceans expected from platform noise.

Conclusions. As a result of the proposal, whales are likely to sustain moderate ecological losses, and other marine mammals are expected to sustain low ecological impacts. However, although unlikely, the northern fur seal may sustain high ecological losses. Overall, the expected regional impacts on marine mammals are moderate.

Cumulative Impacts. In the unlikely event that all tracts in the Southern California Federal OCS are leased and developed within the life of the proposal, the expected number of spills greater than 1,000 bbl is 6.5 and 3.1 greater than 10,000 bbl. The number of spills from crude oil tankering are 12.6 and 7.5. If projected spills from tankering are added, during the life of the proposal the respective number of spills would be 19.1 and 10.6. The State of California is also expected to continue development of its lands. It is assumed some platform placement and oil spills will result from the development of State Tidelands resources. (Natural seepage at Coal Oil Plant varies from 30-600 bbl per day. The Santa Barbara spill in 1969 was estimated by USGS to be about 70,000 bbl.) In addition to oil from spillage, marine mammals are possibly stressed by sewage outfalls and natural seeps. With or without the proposal, some species such as the northern fur seal may suffer high impacts over the life of the proposal. If pollution levels remain constant or increase, some species may suffer low-level impacts from several sources and a general degradation in health is possible. Changes in area usage by cetaceans are expected in order to avoid human activities. Overall, the cumulative impacts are expected to to moderate, that is, some individuals may die or undergo long-term behavior changes but most species are expected to maintain viable populations.

The proposal contributes less than 17 percent of the oil spills greater than 1,000 bbl, less than 14 percent of the spills greater than 10,000 bbl and less than 38 percent of the platforms. The proposal will also contribute to drilling effluents. The proposal does not, however, contribute significantly to other pollution levels such as sewage. Since oil spills and platforms are significant impact agents on marine mammals, the proposal substantially increases cumulative impacts on this resource category whether cumulative impacts include development of all resources offshore Southern California (total resource development), or only resources described for the alternative and non-OCS related projects and proposals. The proposal also increases slightly the possibility of multiple spills contacting an area and thus increasing the level of expected impacts from a spill.

(4) Seabirds: The waters of the Southern California Bight support populations of over 80 species and 15 families of seabirds (Bonnell, et al., 1980). Eleven seabird species breed and nearly 40,000 birds rear their young annually on the Southern California Channel Islands. These islands are the only U.S. nesting site for the brown pelican and the black storm-petrel. Probably the world's largest Xantus' murrelet colony exists here with approximately 75 pairs. The most common nesting species include Cassin's auklet, western gull, ashey storm petrel and Brandt's cormorant. Migrating shear-waters and phalaropes number in the millions in May and June (Center for Coastal Marine Studies, 1980).

The Southern California Islands, especially the Channel Islands, are very important to the many species of nesting seabirds. Seabirds are awkward

on land and must nest in areas with few predators in order to successfully rear their young. Islands and the rocky inaccessible coastline have been traditional nesting grounds.

Nesting seabirds are highly susceptible to impacts from oil spills. Most seabirds feed from the ocean waters and their feathers are fouled while foraging. Hypothermia and death usually follow. Swallowing of weathered crude oil while cleaning can result in the inability to regulate body, water and salt balance. Death due to dehydration can result. Seabirds also appear to be highly sensitive to the irritating and toxic properties of oil. (For a more detailed analysis of impacts to seabirds, see Sowls et al., 1980 and National Academy of Sciences (NAS), 1975. An update of this report should be published in 1981 or 1982.) Additionally, oiled nesting seabirds may contaminate young in the nests. A very small amount of fresh crude oil has also been shown to kill viable eggs of some species (Szaro, 1979).

Some species of birds appear to avoid oil slicks. It is possible adult birds may have learned to avoid oil. Juvenile gulls were more likely to enter oiled water than adults (Nero and Associates, 1981) and shearwaters off Coal Oil Point could not be chummed into oiled waters.

Over the life of the proposal, production of the estimated 0.9 bbl of oil is expected to result in 3.3 oil spills greater than 1,000 bbl and 1.5 oil spills greater than 10,000 bbl are expected to result from the Southern California sales; more than half of these are expected in the Santa Barbara Channel near the Northern Channel Islands. Chances of at least one spill occurring at some time during the proposal and hitting part of the Channel Islands or areas nearby are high. In this case, seabirds would be impacted. Chances of a spill hitting any one particular area in the channel are low. The extent and severity of the impacts will depend on the season, area, and size of the spill. Moderate to high impacts to some species are expected. There is a low probability of a high impact to California brown pelicans and black storm-petrels

Spills in other areas of Southern California waters would have low to moderate impacts. The majority of the birds are migrants rather than resident nesters. Migrant birds are much less concentracted but occur during the winter season when temperatures are lower, oil spills remain longer and storms are more frequent. Resultant deaths are therefore often high though the impact to the entire species may vary.

The behavior, physiology and natural history of many seabirds is not well known. Therefore, the long-term impacts from chronic low levels of petroleum hydrocarbon pollution and continued drilling activities cannot be assessed.

Multiple spills in the same area during the life of the proposal could elevate significant impacts at least one level (example: from moderate to high) due to the inability of a population to recover before a second event. However, chances of two spills occurring in an area due to the proposal are very low.

Mechanical cleanup equipment may be used to reduce oil impacts. Dispersants may be used to speed weathering of the oil and reduce impacts. Oil dispersants may, however, have more harmful effects on marine vertebrates than the oil itself (Dye, 1980).

Many nesting seabirds are sensitive to extraneous noise and disturbance such as that related to hydrocarbon exploration, development and production, and will desert the nest or leave for a long enough time period for a predator, such as gulls, to destroy the nest or for the young to suffer from exposure. Noise pollution can occur from seismic activity, drilling, pipelaying, aircraft, and normal platform activities. Periods of high noise levels are expected to be very brief, and drilling and pipelaying are not expected to be near nesting areas. The potential for a high impact from noise disturbance exists. However, if care is taken to avoid disturbing rookeries as much as is possible, the impacts from noise are expected to be low.

Very little is known about their long-term chronic impacts of drill effluents (see Section 7.a.2)d)(2)). Impacts from this source on marine vertebrates such as seabirds are uncertain.

Overall, moderate impacts are expected to seabirds. Some species may suffer high impacts but since different species migrate and nest at different times, not all species will be affected by a spill.

Conclusions. As a result of the proposal, nesting seabirds are expected to sustain moderate to high ecological losses, and migratory seabirds are expected to sustain low to moderate ecological losses. Although unlikely, the brown pelican and black storm petrel may sustain high ecological losses. Overall, the expected regional impacts are moderate.

Cumulative Impacts. In the unlikely event that all tracts in the Southern California Federal OCS are leased and developed during the life of the proposal, the expected number of spills greater than 1,000 bbl is 6.5 and 3.1 greater than 10,000 bbl are expected. The number of spills from tankering are 12.6 and 7.5. If projected spills from tankering are added during the life of the proposal, the respective number of spills would be 19.1 and 10.6. (Natural seepage at Coal Oil Point varies from 30-600 bbl per day. The Santa Barbara spill in 1969 was estimated by USGS to be about 70,000 bbl.) The State of California is also expected to continue development of its lands. It is assumed some platform placement and oil spills will result from activity in the State Tidelands. In addition to oil from spillage, seabirds are possibly stressed by sewage outfalls and natural seeps. With or without the proposal, some species may suffer high impacts over the life of the proposal. If pollution levels remain constant or increase, some species may suffer low level impacts from several sources and a general degradation in health is possible. Changes in area usage may occur in order to avoid human activities. Overall, the cumulative impacts are expected to be moderate; that is, some individuals may die but most species are expected to maintain viable populations.

The proposal contributes less than 17 percent of the oil spills greater than 1,000 bbl, less than 14 percent of the spills greater than 10,000 bbl

and less than 38 percent of the platforms. The proposal will also contribute to drilling effluents. The proposal does not however contribute significantly to other pollution levels such as sewage. Since oil spills are significant impact agents on seabirds, the proposal substantially increases cumulative impacts on this resource category whether cumulative impacts include development of all resources offshore Southern California (total resource development), or only resources described for the alternative and non-OCS related projects and proposals.

The proposal also slightly increases the possibility of multiple spills contacting an area, thus increasing the level of expected impacts from a spill.

e) Air Quality: A discussion of the primary factors used in assessing onshore air quality impacts which may result from OCS-related activities and the method employed in quantifying the impact on this planning area are described in Section V.A.3 of this document.

Information on nonattainment areas in the planning area is provided in Table V.D.7.a.2)e)-1 and illustrated in Figure V.D.7.a.2)e)-1.

TABLE V.D.7.a.2)e)-1.
NONATTAINMENT AREAS WITHIN THE REGION

State	Area	Nonattainment Pollutants
Caifornia	South Central AQCR	TSP, O_3, CO.
	South Coast AQCR	TSP, O_3, CO, NO_2
	San Diego	TSP, NO_2, 03, CO.

It is estimated that 211 exploratory wells will be drilled to identify the resources and 920 development/production wells and 37 platforms to develop- the resources under this alternative. It was assumed, for the purposes of analysis, that production from an average platform would be 0.8 million barrels of oil and 1.3 billion cubic feet of gas per year. One-half of the oil produced in the region is assumed to be transported by tanker or barge and half will be transported through subsea pipelines.

Estimated representative emissions per platform for development/production operations are provided in Table V.D.7.a.2)e)-2.

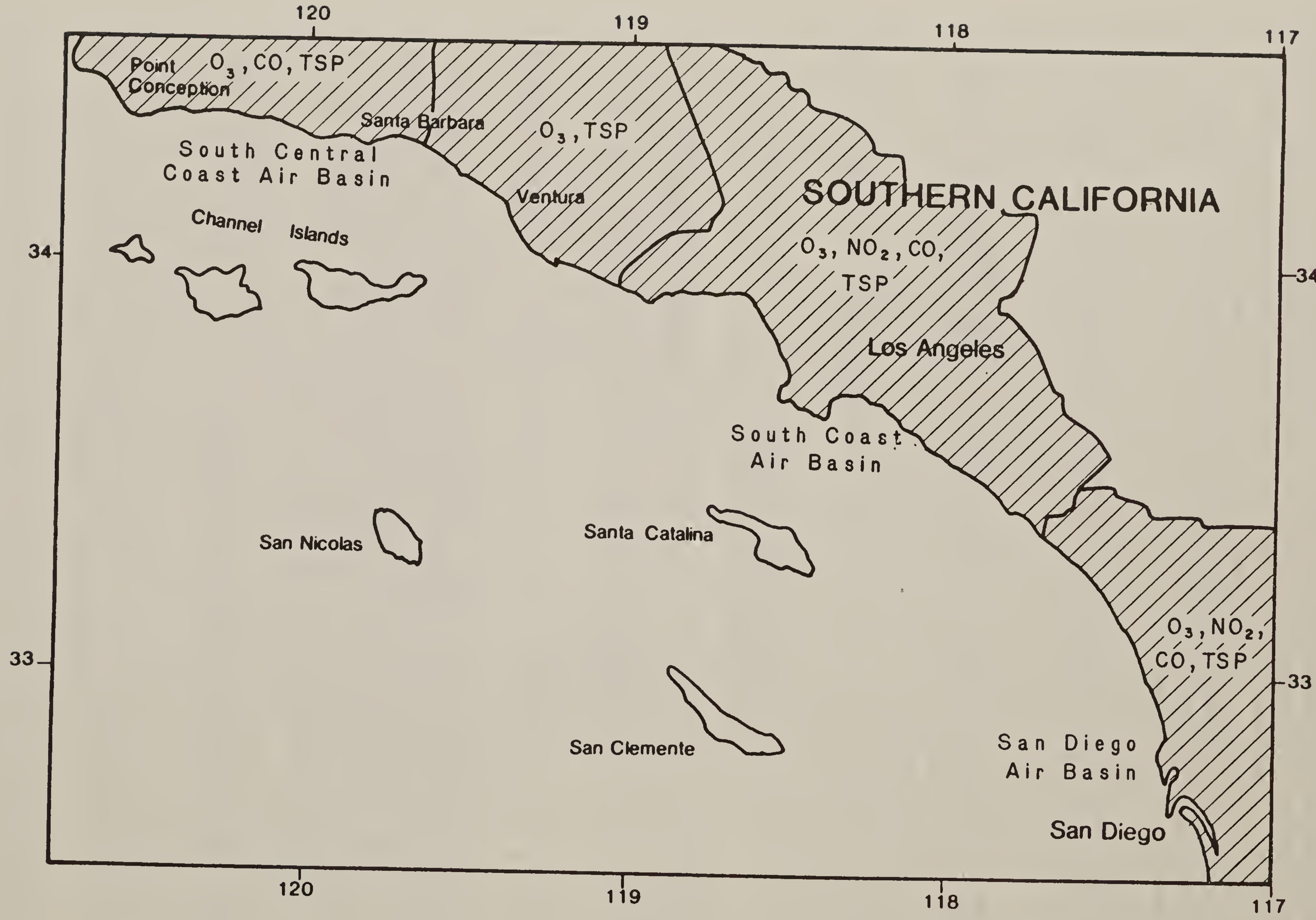


Figure V.D.7.a.2)e)-1 Southern California Region

TABLE V.D.7.a.2)e)-2
ESTIMATED REPRESENTATIVE EMISSIONS (PER PLATFORM)

Activity	Pollutant Emissions (tons per year) VOC	NO_x	TSP	SO_2	CO	Notes/Source
Platform installation	16	465	22	31	75	ERG (1981) - assumes platform installation occurs over 9 months, includes all support activities
Development drilling	9	240	11	21	71	ERG (1981) - assumes 2 wells drilled at a time and 12 wells drilled per year, includes all support activities
Oil/gas production	4	100	3	5	26	ERG (1981) - assumes average production of .8 million barrels of oil and 1.3 billion cubic feet of gas per year - all activities including on platform operations and all support activities
Barging	27	5.4	0.2	0.4	0.8	ERG (1981) - all phases of barging including loading and unloading and transit to and from platform (platform is assumed to be 20 miles from shore and half of the oil produced is barged to shore)

Thirty-seven platforms are expected to be installed over the 19 million acres of the planning area. Cumulative onshore impacts due to the aggregate emissions from all these platforms are possible, but are unlikely to be

serious if they occur at all. Each of the 37 platforms likely will affect the onshore coastal area for 5-10 years during exploration, platform installation, and development drilling and for about 30 years during the production phase. The installation of the 37 platforms will occur over a 13 year period. Total aggregate emissions loading appears high (if one multiplies the figures in Table V.D.7.a.2)e)-2 by 37 for each phase of operation). This total from the planning area can be calculated but is not a useful measure of the onshore air quality impacts. These impacts at a particular location are the critical factors and dependant on the location of platforms, the phase of operation and its level of activity and the number of platforms that can potentially affect the onshore air quality at that location. In reality, onshore impacts will be spread along the entire coastline in relationship to the location of the platforms and the distance from shore. Only if several platforms were located close together and near to shore would cumulative impacts onshore be significant problem. This is unlikely for two reasons: 1) it is generally more economical to develop an area from one platform, rather than drill from several smaller platforms scattered over a very small area and 2) if platforms are close together and cumulative impacts are possible, the onshore impact would be mitigated by the cumulative impact provisions of the DOI rules.

OCS facilities located within 20 miles of the Southern Coastline will likely require emission controls. Of the 37 proposed platforms associated with development of Alternative I-1 hydrocarbon resources, 25 are expected to be located within 20 miles of the coast and require controls. No new refineries or gas processing plants are anticipated for the development of the resources and, therefore, onshore facilities are not expected to contribute significantly to air quality degredation (see Land Use, Section V.D.7.a.1)d)).

A low qualitative impact is expected from routine emissions. Although the region is predominantly nonattainment for several pollutants, no new major onshore sources are forecast. Uncontrolled pollutant emissions from near-shore and offshore sources will cause onshore air quality impacts in excess of the significance levels of the DOI air quality rules (these levels represent 2% of the NAAQS). If a blowout, oil spill, or fire were to occur at a platform near-shore, short-term violations of several NAAQS could occur onshore, depending on the type and duration of the accident.

Platform emissions are compared to the DOI air quality rules allowable emissions levels as determined by the exemption formulas (E=33.3D for TSP, SO_2, NO_x and VOC and $E=3400D^{2/3}$ for CO where E is the emission exemption amount expressed in tons per year and D is the distance of the proposed facility from the closest onshore area expressed in statute miles). If a facility is not deemed exempt by the exemption formulas, an approved air quality model is used to determine if the air emissions result in a significant onshore air quality impact. For example, assuming 3 months of development drilling occurs immediately upon completion of platform installation, 525 tons of NO_x could be omitted in 1 year based on the representative emissions. If this platform were located beyond 16 miles from shore, it would be exempt from DOI emissions controls.

Any emission sources which would significantly affect the onshore air quality would be subject to mitigation required by EPA and the State, if located onshore, or by DOI, if located on the OCS. Required controls would conform with Best Available Control Technology (BACT) and emission offsets, if needed. A discussion of possible BACT for all phases of OCS operations can be found in ERG (1981) (pages VII-1 through VII-4). The control options discussed address the major emission sources: for VOC emissions from barging, vapor control lines are a possible control; for NO_x emissions from power generation, cabling in onshore electricity or the use of natural gas turbines; and for SO_2 emissions during the processing of sour gas; the installaltion of a Claus Sulfur Recovery System. Fugitive VOC emissions from values, pumps and lines are controlled by proper installation and maintance.

Conclusions. The level of expected impacts to air quality is expected to be low. No new major onshore sources are associated with the proposal. Near-shore offshore activity will cause some impact. Overall, the level of expected impacts is low.

Cumulative Impacts. It is estimated that a total of 1.8 billion barrels of oil and 3 trillion cubic feet of gas exist in the entire Southern California Federal OCS planning area. Additional reserves underlie State Tidelands, and are expected to be developed. In the event that total development of all Federal reserves occurs over the life of this proposal, 74 new platforms with 1,840 wells would be required. It is very unlikely, however, that this magnitude of developemnt will occur over the life of this proposal.

The major influencing factors affecting the onshore air quality in Southern California as a result of OCS development are: 1) the number of new wells drilled, 2) the location of the platforms, 3) the timing of the activities, 4) the magnitude of the produced products barged to shore, and 5) the local instantaneous meteorological conditions. Prevailing winds off Southern California are from the west and southwest. Temperature inversions are present during most summer mornings and to a lesser extent during most summer months and to a lesser extent during the winter. (See Section IV. C.2). The proposal contributes moderately to regional cumulative air quality and from low to very high to localized cumulative air quality whether cumulative impacts include development of all resources offshore Southern California (total resource development) or only resources described for the alternative and non-OCS related projects and proposals.

The increase in oil and gas development delineated in the proposal will occur as the Southern California area grows in population as a result of unrelated industrial and commercial growth in the region. In most cases, oil and gas activities will be a very small part of this overall growth.

The cumulative impact of this overall growth could increase ambient pollutant concentrations to a level where some future industries would be forced to comply with stringent emission controls to avoid exceeding air quality standards. This may affect future economic conditions of Southern California communities by restricting industrial developemnt.

A possible significant cumulative air quality impact may result from the increased level of transporting the produced products from the platforms to shore by barge. This impact could be minimized by the use of pipelines as the transport method.

Another possible significant cumulative impact may result from the clustering of many platforms near one another. This situation along with the barging of produced products to shore may result in very high localized cumulative impacts. This impact could be minimized by the piping of oil from the production platforms to shore, the application of the DOI air quality miles which have a provision to address the cumulative impact of many OCS facilities, and the fact that clustering will probably not occur.

To conclude, no significant cumulative impact is anticipated as a result of combined oil and gas development activities on State Tidelands and the OCS. The severity of air quality impacts will be influenced primarily by the number of oil and gas activities, their locations, and the timing. For example, emissions from additional platforms in some sections of Southern California will be virtually undetectable due to high ambient pollutant levels. Conversely, platforms constructed and operated in areas with minimal human activity (such as Tanner-Cortes Banks) will significantly affect local air quality conditions. Overall, regional air quality impacts are expected to be moderate; local impacts will range from low to very high. However, EPA rules associated with the Clean Air Act and the DOI air quality rules have provisions to minimize these impacts.

f) Recreation and Tourism

(1) Coastal Recreation: Southern California (Point Conception to the Mexican Border) accounts for about 80 percent of the economic values of California's coastal recreation. For this reason, the area would be very sensitive to oil spills occurring as a result of the proposal. Waterborne recreational activities which would be adversely affected by oil spills in this region include boat cruising, water skiing, racing, sailing, swimming, diving, and fishing. Seashore-related recreation activities such as beachcombing, shell collecting, painting, shoreline nature study, camping, and sunbathing would also be adversely affected by an oil spill. Boat traffic might also be restricted if harbors were closed due to the installation of booms. A loss of beach usage and boating opportunities due to an oil spill could have a significant impact to the coastal recreation economy. Tourism is one of the three largest industries in California, directly affecting more than one million jobs.

As a result of the proposal, there are 37 platforms expected to be installed over the life of the project and an anticipated total of 3.3 oil spills greater than 1,000 bbl and 1.5 oil spills greater than 10,000 bbl to occur from development of the resources. Slightly over half of these platforms

and spills are expected to be in the Santa Barbara Channel, with the remainder distributed in the other favorable geologic areas. Impacts are therefore expected to be greater in the Channel than elsewhere in the Southern California Bight.

The Santa Barbara oil spill in 1969 provides a good example of possible impacts to the area. The spill affected 30 miles of beaches. A study done by Mead and Sorensen on the Economic Cost of the Santa Barbara Oil Spill concluded that the spill diverted tourists to other areas so that losses to motels and restaurants in the impacted area were offset by gains to those in other areas. Because of this diversion, they concluded that the overall loss to tourism was negligible, although there were individual localized losses in the affected area. As part of this study, a survey was conducted to determine the loss of recreation opportunities to residents of the Santa Barbara area. This loss was projected to be 744,000 beach visits. The value of the recreation opportunities lost was projected to be $13,150,000 direct spending on recreation by the area residents (Mead and Sorenson, 1970). The value of recreation and tourism directly related to the coastal zone was in excess of $2.6 billion in 1980 with an estimated beach usage of 138 million visitor days and an estimated boat use of 26 million participant days (The Granville Corporation, 1981; Cal. Office of Tourism, 1981).

Sportfishing is a very important recreational activity throughout Southern California. Five fishing methods predominate: shore, pier, private boat, commercial passenger fishing vessel (partyboat), and diving. The oil spills expected to result from adoption of the proposal are likely to cause a reduction in fishing space and time. These impacts most likely will be greatest in the Santa Barbara Channel since this is an important sportfishing area and over half the development in Southern California is expected in this area. Sportfishing for clams may be moderately affected since a large oil spill could contact important clam beds. Operators of commercial passenger fishing vessels may sustain temporary moderate economic impacts since they may be confined to port by oil containment booms or fishermen may fish elsewhere due to adverse publicity of an oil spill. In addition, if fish or invertebrate populations decrease due to impacts from oil spills or other impact agents (see discussions in Sections V.D.7.a.2)a) and b)(1)), sportfishing could sustain low impacts since there would be a loss in potential catch. These potential impacts are expected to be short term in duration.

Offshore structures have both beneficial and adverse effects on recreation and sportfishing. A concentration of offshore structures could inhibit visual quality, sailing, and boat racing, and may be a minor hazard to navigation in adverse weather. Impacts will be greatest in the Santa Barbara Channel since over half of the development in Southern California is expected in this area. However, the structures also serve as good navigation markers and places where emergency help can be obtained in case a vessel is disabled or a crewman is injured. Offshore structures are valuable navigation aids since they are often the only references available to the recreational boater, who often has little sophisticated navigation equipment.

Sport fisheries are often enhanced by offshore structures due to the artificial reef effect. These structures provide food and cover in areas that otherwise are largely devoid of these essentials. The actual value of the increased sport fishery potential in the vicinity of an offshore structure in California is limited, however, since tying up to structures is prohibited, and anchoring or drifting next to a platform is discouraged.

Pipeline installation will cause a temporary reduction in beach use at and near the landfalls. However, once installation is completed pipelines will have negligible effect on beach use and general recreation in the area unless a break or rupture occurs in the line.

As a result of all proposed activities described above, the adverse impact of the proposal on the recreation of the area is expected to be minor unless an oil spill contacts the shoreline. In such a case, decline in recreational use would lead to a loss of tourist revenue and recreational enjoyment. The adverse impact to tourism could be localized and short term with mild proposal-wide economic consequences, but also could become regional in scope and more economically damaging depending on the beach location, size, duration, nature and season of the spill, and publicity associated with a major pollution incident. The loss to recreation, both water borne and beach oriented, would be very high for the area where any large oil spill contacted. The exact economic impact cannot be stated as it is entirely dependent on conditions present at the time of the spill and has to include all costs of cleanup, loss to the local economy, and compensation to the local businesses. However, any loss can be expected to be in the millions of dollars in value lost and, as such, a high impact could be expected from the proposal. Overall, the regional impacts on recreation and tourism are expected to cause very high impacts to some local areas, and low impacts to other local areas. Thus, regionally any impact occurring is expected to be able to be absorbed.

Conclusions. As a result of the proposal, the loss to recreation, both water borne and beach oriented, is expected to be very high for the area where any large oil spill contacts shore and moderate for the region.

Cumulative Impacts. The cumulative impacts from existing industrial, residential development, the proposal, and development of existing offshore oil and gas leases in Southern California (Federal and State) as well as future resource development, are expected to be far greater than those discussed above. In the unlikely event that all the hydrocarbon resources on the Federal OCS are developed within the life of the proposal, 6.5 spills greater than 1,000 bbl and 3.0 spills greater than 10,000 bbl can be expected. Additionally, crude import tankering from Alaskan and foreign sources over the next 30 years can be expected to contribute 12.6 spills greater than 1,000 bbl and 7.5 spills greater than 10,000 bbl to the planning area. An additional unknown number of spills is likely from continued State Tidelands hydrocarbon resource development. The major impact would come from spilled oil from OCS and State hydrocarbon development and from import tankering of crude, which could affect general beach use, recreational boating, and sportfishing in any area of impact. Tourism would be affected by an amount dependent on the volume of oil, the time of year, the geographic area affected and the year in which the spill occurs.

During the life of the proposal, there are expected to be 74 additional platforms possible for the development of all OCS hydrocarbons in the planning area. Additional platforms may result from continued State Tidelands development. The proposal contributes less than 17 percent of the oil spills greater than 1,000 bbl, less than 14 percent of the spills greater than 10,000 bbl and less than 38 percent of the platforms expected for the region. Since oil spills and platforms are among the more significant impact-producing agents on coastal recreation, the proposal moderately contributes to the cumulative impact on this resource category whether cumulative impacts include development of all resources offshore Southern California (total resource development), or only resources described for the alternative and non-OCS related projects and proposals. Projected increases in population as well as other factors will result in an increase in recreational participation. For Southern California, this increase could reach as high as 413 million participation days per year for beach use and 44 million participation days per year for boating during the life of the proposal. Thus, locally, a very high impact on coastal recreation could be expected in Southern California, if an impact occurred during the high use season at a high use recreation area. Overall, the expected regional impacts are moderate.

(2) Visual Resources: Social, economic, cultural, and philosophic backgrounds greatly vary one's perception of esthetic values. The sight of an offshore structure may significantly decrease one observer's enjoyment of the coast, while another would be unaffected. Using a landscape-architectural viewpoint, the potential impacts on visual resources from OCS development have been identified (The Granville Corporation, 1981). Other impacts on visual resources which are more difficult to ascertain are reduced beach usage, reduced recreational spending, decline in property value, and reduction in residential enjoyment.

Offshore oil and gas development and related onshore support facilities will have an adverse impact on visual resources, with the degree of impact dependent upon the nature and number of the facilities and their location. Visual resource degradation could decrease recreational enjoyment of the beaches and coastal waters for some people. Onshore visual impacts would be minor and no new facilities other than a gas processing plant at San Diego and some expansion of existing facilities are expected. However, a localized high impact could occur if development occurs in a new location, but since any development is expected to occur in areas which already have similar development, a low impact is anticipated.

Offshore platforms will cause the longest lasting, most prominent visual impact. The platforms are fairly prominent objects exhibiting discordant vertical and angular lines against the soft horizontal plane of the sea. Portions of a 190-foot platform structure may be seen from the water's edge if it is located within 17 miles of the shoreline. From elevated vantage points, the visual range increases in proportion to elevation. At distances beyond about 15 miles, the size of platforms would appear very small and may be obscured by natural sea haze from 40 to 60 percent of the time. Dense fog and haze may obscure platforms situated at the 3-mile limit up to approximately 22 percent of the time, depending upon local climatic features (Naval Weather Service, 1976).

The proposal is projected to result in the installation of 37 platforms in the Federal OCS offshore Southern California. The exact positions of these are not known at present, but it can be assumed that slightly over half will be placed in the Santa Barbara Channel, with the remainder in the favorable geologic areas offshore the Santa Monica Bay area, and the San Diego-Orange County coast. The impact caused by the placement of these structures could range from low to high depending upon the specific location, with an overall moderate impact.

A significant visual impact could occur onshore in the event of a major oil spill. Accidental spills could occur as a result of vessel loss, production equipment failure, pipeline ruptures, or well blowouts. Some low-level spillage will occur during the course of normal operations. The duration of oil fouling on the beaches ranges from a few days to years, depending upon the type and amount of spillage, extent of cleanup efforts, beach sand transport mechanisms, and oil composition. Any oil fouling of beaches would have an adverse effect on visual quality until the oil is removed by either cleanup efforts or natural processes.

If a spill does occur and impact the beach, a very high visual impact would occur in the area of contact. The proposal is expected to result in 3.3 oil spills over 1,000 bbl and 1.5 over 10,000 bbl in the Southern California planning area. Of these 3.3 spills, approximately 1.8 are expected to occur in the Santa Barbara Channel, and these will have a high possibility of impacting the mainland or island shoreline. The spills occurring in the other areas will have a moderate possibility of contact with the beach due to the oceanic circulation.

If the proposal-related development occurs as stated, impacts can be expected locally to visual quality where development occurs. The exact amount of degradation will depend upon the location and type of OCS structure, or upon the location of the spill and the nature of the shoreline that is impacted. Overall, the regional impacts on visual resources are expected to be moderate since the proposal is expected to cause very high impacts to some local areas and virtually no impact to other local areas.

Conclusions. The proposal is expected to cause very high impacts to some local areas where platforms are concentrated or where a large oil spill reaches shore. Overall, the expected regional impacts on visual resources are moderate.

Cumulative Impacts. Cumulative impacts to visual resources will come from existing and future industrial and residential development, the proposal, and from development of existing offshore oil and gas leases in the area (Federal and State) as well as future resource development offshore Southern California, and are expected to be greater than the impacts already listed.

The major impacts to the resources would come from three main sources: spilled oil, offshore platforms, or onshore facilities. Spilled oil could appear in the area from such sources as tankers, existing platforms and pipelines, sewage discharges, and natural seeps. Of these, the most important are sewage discharge and natural seeps, which together discharge over 1,000 barrels of oil and grease into the Southern California Bight

every day. This oil can appear on the beaches in the form of tar balls and oil sheens and as such, detracts from the beauty of the beach. There are at present 9 platforms and 7 artificial islands in State waters and 14 platforms and one OS&T in Federal waters off Southern California. In the unlikely event that all the hydrocarbon resources on the Federal OCS are developed within the life of the proposal, 6.5 spills greater than 1,000 bbl and 3.0 spills greater than 10,000 bbl can be expected. Additionally, crude import tankering from Alaskan and foreign sources over the next 30 years can be expected to contribute 12.6 spills greater than 1,000 bbl and 7.5 spills greater than 10,000 bbl to the planning area. An additional, unknown number of spills is likely from continued State Tidelands hydrocarbon resource development. For the development of the Federal OCS hydrocarbon resources, 74 additional platforms for Southern California are expected. In addition, development is expected to continue to occur in State waters with an unknown number of additional structures. This will increase the impact from moderate to high, dependent upon the location of each platform, and the timing and track of each anticipated spill. There will be a slight increase in onshore facilities, but this will have a minor affect on the area's visual quality. Thus, a high impact on visual resources could be expected locally for those areas where development occurs.

The proposal contributes less than 17 percent of the oil spills greater than 1,000 barrels, less than 14 percent of the spills greater than 10,000 barrels, and less than 38 percent of the platforms expected for the region. Since oil spills and platforms are among the most significant impact-producing agents on visual resources, the proposal substantially contributes to impacts on this resource category whether cumulative impacts include development of all resources offshore Southern California (total resource development), or only resources described for the alternative and non-OCS related projects and proposals. Overall, the expected regional impacts are moderate.

g) Socio-economic Factors: Impacts to the socio-economic environment result from exploration, development, and production of OCS hydrocarbon deposits. Changes in the socio-economic environment also can result from development of additional onshore OCS-related infrastructure, and increased demand for services by those economically dependent on OCS-related activities. Land use impacts associated with OCS-related infrastructure are discussed in Section V.D.7.1)d). Cumulative impacts addressed in the following subsections are a result of this increased full development of the OCS oil and gas resources, State Tidelands hydrocarbon development, the proposed San Pedro Bay Coal Terminal, the MX project, the Space Shuttle, Port Hueneme expansion, and the Point Conception LNG Facility and continuing development pressures and population growth.

(1) Employment: Changes in employment opportunities in Southern California may result from exploration, development, and production activities in the OCS. Employment is also increased by demand for OCS-related investments onshore and through an increased demand for services by those directly or indirectly employed in OCS-related activities. Employment is expected to increase by 13,000 or by 0.21 percent of the anticipated employment levels of 1990 (DOI, 1981a). Most of the increased

employment opportunities are expected to be filled by people moving into the State.

Over 50 percent of the resources and related development is expected to occur in the Santa Barbara Channel with the resulting increase in employment being concentrated in Santa Barbara-Ventura. The concentration of job opportunities in Santa Barbara-Ventura should result in a small increase in the dependency of the local economies on OCS-related activities.

Forecast of 1990 employment increases and economic activity may already include the expected levels of activity associated with this alternative. Employment increases will probably fall 10 to 20 percent short of the forecast, because of some inclusion in the base level. With development of this alternative, employment is expected to increase by 10,600 jobs.

Conclusion. Employment opportunities are expected to be increased slightly on a regional basis but result in a continued move to concentration of jobs related to OCS activity in the Santa Barbara-Ventura area. Overall, impacts are expected to be low as a result of this alternative.

Cumulative Impacts. In the unlikely event that all tracts offshore are leased and all resources are developed during the life of the proposal, cumulative impacts from this alternative, other projects, and ongoing growth pressures, could result in an increase in employment opportunities by 1,038,000 of 17 percent of the 1990 expected employment. The impact from an increase of 17 percent is expected to be of high impact. The contribution from this proposal is approximately 1 percent of expected increase to 1990, or 0.2 percent of total 1990 employment. Therefore, the contribution from OCS-related development from this proposal is very low whether cumulative impacts include development of all resources offshore Southern California (total resource development), or only resources described for the alternative and non-OCS related projects and proposals.

(2) Population and Demography: Southern California population is expected to rise as a result of the increased employment opportunities generated by OCS development and economically related activities. The addition of 21,600 people to 1991 Southern California population projection is a change of less than 0.2 percent (DOI, 1981a). The increase in population is the result of 10,600 jobs created by this alternative and the 2.04 people supported by a job. The expected increase in population may be implicitly included in population projections done by various agencies and, therefore, be overstated.

The addition of more than 50 percent of the anticipated changes in population as a result of this alternative to the Santa Barbara-Ventura area could result in a severe but temporary housing shortage. Population changes associated with this alternative would cause a demographic change of the coastal communities as the less affluent are compelled to move inland because of rising housing cost associated with increased demand for housing. In the unlikely event that population is spread throughout the region and not concentrated heavily in Santa Barbara-Ventura, the impacts of this alternative would be insignificant.

The regional increase in population resulting from this alternative is expected to be in the range of 19,100 to 25,500. The increase in Santa Barbara-Ventura population is expected to be more than one-half of the regional increase.

Conclusions. Impacts on population from this alternative are low on a regional basis, but are expected to create a significant short-term disruption to the economies of Santa Barbara and Ventura Counties because of housing and public services shortages. Overall, the long-term impact from this alternative will be low.

Cumulative Impacts. In the unlikely event that all tracts offshore are leased and all resources are developed within the life of the proposal, population is expected to increase by 1,939,000 between 1981 and 1990. This proposal is expected to contribute 1.1 percent of the change through 1990. The cumulative increase of 14 percent is a high change over time; however, the contribution of the proposal is 1.6 percent of the 1990 population. Therefore, the contribution of the proposal is low whether cumulative impacts include development of all resources offshore Southern California (total resource development), or only resources described for the alternative and non-OCS related projects and proposals.

(3) Public Facilities and Services: Increases in population and economic activity will generate more demand for public facilities and services. The impact of this increased demand is dependent upon local communities' ability to fund increases in the supply of public facilities and services and the availability and condition of existing public facilities and services. Water supply is the only public service expected to be significantly impacted on a regional basis under the most likely scenario (see Section V.D.7.a.1)a)(1). Impacts from this alternative on Santa Barbara-Ventura will be moderate to severe on water supply, sewage treatment, schools, and local finances and economies. In the event that the changes in economic activity are less concentrated and spread throughout the region, the impacts will be insignificant on a regional level.

Should the expected changes in population and economic activity already be included in forecast for demand of public facilities and services, the impacts from this alternative will be overstated.

Development of this alternative will assure significant impacts on water supply and to the extent related growth occurs in the Santa Barbara-Ventura area, sewage treatment facilities, schools, and local finances and economies will suffer significant negative impacts. Negative impacts to Santa Barbara-Ventura public facilities and services result from the inability of local agencies to fund the expansion necessary to meet the requirements of the increased population and economic activity from this alternative.

Conclusions. Except for water supply the regional impacts on public facilities and services are expected to be very low. Locally, impacts in Santa Barbara-Ventura are to be moderate to severe on water supply, sewage treatment, schools, and local finances and economies. Overall impacts from this alternative will be low.

Cumulative Impacts. In the unlikely event that all tracts offshore are leased and all resources are developed within the life of the proposal, cumulative impacts from this alternative, other projects and previous sales will result in significant high impacts to water supply, sewage treatment facilities, schools, and local finances and economies in the Santa Barbara-Ventura area. Within the Southern California region, impacts on water supply will be significant, while other public facilities and services will be impacted insignificantly. Since non-OCS-related impact agents have the greatest impact on public facilities and services, the contribution of the proposal is low whether cumulative impacts include development of all resources offshore Southern California (total resource development), or only resources described for the alternative and non-OCS related projects and proposals. However, a small incremental impact is likely to result in significant impacts to Santa Barbara-Ventura because of limited financial resources available.

3) Impacts on Other Management Plans: The plans and activities associated with oil and gas leasing, exploration, and development are generally affected by other plans and management efforts rather than influencing them. It is conceivable, however, that some plans as discussed below could be altered or changed due to the proposal.

The California Coastal Management Plan (CMP), developed according to the provisions of the Coastal Zone Management Act (CZMA), was approved by the Secretary of Commerce in 1978. The primary vehicle for implementation of the CMP is the local coastal program (LCP). Section 307 of the CZMA states that projects requiring a Federal license or permit and affecting land or water uses in the coastal zone must be conducted in a manner consistent with the CMP. The Secretary of Commerce may override this provision in the interests of national security, or by finding that the activities are consistent with the objectives of the CZMA. Thus, there is an interaction between Federal OCS oil and gas lease sale activities and LCPs. None of the approved LCPs are directly affected by the proposal (Alternative I-1). Should concern arise, the LCPs may incorporate or be amended to ameliorate potential impacts. Port Master Plans (PMPs) are similarly involved with proposed OCS oil and gas leases and activities, and it is conceivable that these may also be affected.

Offshore water quality, if degraded by actions resulting from the proposal, could affect future plans to dump materials in the OCS (municipal and industrial sewage outfall plans). Degraded water quality could impose limitations on volumes or concentrations of effluents from onshore activities allowed under LCPs.

Dump site plans may have to be altered under the present proposal if full development of the proposal occurs. Presently used ocean dump sites may have to be abandoned due to the present proposal. Conflicts between sites may occur should the positioning of platforms or subsea structures be necessary in areas where radioactive material has been dumped; similar conflicts could occur at toxic pollutant dump sites which could release pollutants due to physical disturbances from exploration or development.

The proposal could affect OCS-related infrastructure plans in the LCPs mentioned previously and local general plans. Public service and facility improvement plans may be affected. Sanitation district capital expenditure plans could also be affected by the proposal. Water supply planning and management (in the coastal zone, a function under LCPs) could be affected by demands on water supply resulting from this proposal.

Cultural resources on the OCS fall under the purview of the National Historic Preservation Act, as amended, and other protective legislation so long as they are related to the development of federally owned minerals. As such, they are subject to coordination and review requirements of those acts. There are no national or local management plans for OCS cultural resources per se.

The proposal could affect the plans for designating Areas of Special Biological Significance (ASBS) in the California Coastal Zone.

The 1976 Fishery Conservation and Management Act gives the United States jurisdictional control and management responsibility for all fishes except migratory tuna within a conterminous distance of 200 miles of the coast. The Pacific Fishery Management Council (PFMC), in cooperation with the Department of Commerce, regulates the amount of harvest, harvest seasons, and type of gear used in Federal waters off the coast. In State waters (0-3 miles), the California Department of Fish and Game regulates fishing. The PFMC has prepared plans for fishery management for several fisheries and these are reviewed and revised as necessary (plans in draft or final form exist for salmon, northern anchovy, groundfish, pink shrimp, jack mackerel, herring, squid, crab, and billfish). The proposal, and any effects on fisheries from activities associated with the proposal, could require a revision of these fisheries' plans to account for potential decrease in fish population. The impact of the proposal on these plans is expected to be low.

Marine mammals are protected by the Marine Mammal Protection Act which allows the Department of Commerce to manage and plan the capture of any mammals. The loss of any animals due to OCS activities associated with the proposal would need to be considered in setting the regulations. Management plans for threatened or endangered species (several whale species and the southern sea otter) may have to be modified due to the proposal or subsequent activities associated with oil and gas leasing.

Management plans for the California brown pelican may also be affected by the proposal. Noise and other disturbances near the nesting sites could cause losses to the population and adjustments in future management plans could be necessary.

Oil and gas activities occurring on the OCS in Southern California as a result of this proposal should have no impact on air quality management plans of local air pollution control districts. OCS emissions are regulated by the Department of the Interior air quality regulations which require that the magnitude of onshore impacts be evaluated using significance levels representing the maximum allowable incremental increase in ambient onshore air pollution. If the evaluation shows that the significance levels are

exceeded, the lessee must either fully reduce the emissions so that there is no onshore impact or apply the best available control technology and model to determine whether the emissions still exceed maximum allowable increases. If the latter still results in excess increase, the lessee must apply whatever controls are necessary to reduce emissions. The overall effect will be to reduce emissions so that there are no effects onshore in nonattainment areas. In attainment areas, emissions are regulated so that onshore concentrations do not exceed maximum allowable increases.

The California Coastal Commission sets standards for scenic areas on the coast and designates scenic areas. The proposal could result in offshore platforms reducing visual aesthetics and, therefore, influencing future designation of coastal scenic areas.

The proposal could remove a small amount of coastal land available to recreation and, therefore, affect the recreation and access elements in local LCPs.

4) Unavoidable Adverse Impacts: Oil spills, discharges of drilling muds and cuttings, formation water discharge, and sewage disposal will all cause unavoidable adverse impacts on water quality under the proposal. Impacts from all but oil spills could be mitigated by EPA NPDES restrictions to discharging.

Water supply would be unavoidably adversely affected by this proposal. Limited supplies would be consumed by OCS-related infrastructure and development, further increasing demands on a limited resource.

Unavoidable adverse impacts to ports and navigation would occur in the expected cases of oil spills. Traffic reduction into and out of ports and rerouting through areas would be required. Selection of Military Stipulation No. 1, the Geological Stipulation, and the Transportation of Hydrocarbon Products Stipulation would mitigate some of these adverse impacts. The proposal would have unavoidable adverse impacts on traffic lanes unless the above stipulations are invoked.

The unavoidable adverse impact the proposal would have for land use would be a reduction in the amount of land available for other uses over the life of the activity. Occupation of land by OCS-related activities and structures is considered minimal.

There will be some unavoidable losses of submerged and terrestrial cultural resources. Losses are felt to be unavoidable due to the difficulty of detecting submerged and buried terrestrial resource sites. However, the adoption of the Cultural Resource Protection Stipulation for each OCS sale will reduce the probability of significant loss.

Coastal benthic ecosystems would be unavoidably adversely affected from the proposal due to oil spills and various discharges mentioned above for water quality. The level of impact is restricted geographically and temporarily.

The proposal would have unavoidable adverse impacts on surface fishes (e.g., Pacific bonito, jack mackerel, northern anchovy, and California grunion) due

to oil spills. Oil spills would also cause unavoidable impacts to commercial fisheries. Trawl fishermen offshore California would suffer unavoidable adverse impacts due to platform conflicts with trawl fishing. It is not known at present if mud mounds created by OCS oil and gas activity are unavoidable adverse hazards to bottom fisheries. Recent lease stipulations applied to Pacific OCS sales if applied to this proposal would still leave unavoidable adverse impacts.

Unavoidable adverse impacts would occur to endangered and threatened species due to the expected oil spills. The California sea otter and California brown pelican would suffer impacts but the level is dependent on where and when the spills occur. Regional endangered species consultation with FWS and NMFS has taken place and future consultation will be conducted, as needed, but jeopardy to these species and habitats is not expected.

Air quality in the immediate vicinity of an OCS oil and/or gas activity will be unavoidably affected. Emissions from internal combustion engines, turbines, leaky valves, etc., will degrade air quality near drill ships, platforms, pipelaying barges, refineries, and gas processing facilities.

Unavoidable adverse impacts to recreation would occur through beach closure if a spill hit shore during a tourist season. Oil spills would temporarily close marinas and boat launching facilities adversely affecting sportfishing, and boating.

Visual resources will suffer unavoidable adverse impacts due to platform construction on the OCS. Scenic areas will be visually degraded but the extent of degradation is dependent upon the placement of platforms. Visual adverse impacts will last the lifetime of the projected OCS oil and gas activities.

5) Relationship Between Short-Term Uses of Man's Environment and Long-Term Productivity: The proposal is expected to have a 30-year lifetime at minimum. Activities which precede the proposal, have a lifetime exceeding the termination of oil and gas activities, and which affect long-term productivity locally and regionally are water supply, recreation, land use, coastal ecosystems, commercial fisheries, and endangered and threatened species.

The use of limited water supplies for OCS-related activities could result in short-term scarcities. This could translate into some sagging onshore productivity in the long-run due to water limited onshore industrial growth in some areas.

Recreation will suffer short-term impacts due to the removal of several coastal locations from recreational use for the duration of the project. There may be a delay in return to normal recreational use after the project. Crew boats may compete with sportsfishing boats causing short-term conflicts for the life of the project.

Changes in land use associated with OCS activities in this proposal should result in short-term impacts to the human environment. This will not

influence long-term productivity. It is not likely that valuable coastal land would be left alone and not returned to other productive activities.

Coastal ecosystems are likely to suffer short-term impacts to productivity during various phases of OCS activity. These impacts could translate into long-term impacts on fisheries production and long-term impacts on productivity of sensitive marine habitats such as estuaries and Tanner-Cortes Banks. With the cessation of oil and gas activities, the marine environment is generally expected to return to its normal long-term productivity levels.

The long-term effects of platforms and other OCS-related structures on sports fisheries is not known, however, no long-term adverse impacts on sports fisheries or commercial fisheries in Southern California are expected at present.

The proposal is expected to have a minor long-term impact on marine mammal populations in Southern California. This effect on marine mammal population productivity and also seabird populations may be due to direct effects, or effects felt through food web modifications induced by the proposal.

6) Irreversible and Irretrievable Commitment of Resources: Cultural resources in the Southern California OCS is one resource that may suffer irreversible commitments of the resource if the proposal is adopted. Destruction or disturbance of a cultural resource site either by construction or by scientific exploration is permanent. The value of a site is lost to a very large extent if disturbed even if relics are subsequently recovered.

Rare species inhabiting benthic marine ecosystems may be damaged irreversibly from activities on the OCS associated with this proposal. The nature of potential resource change (irreversible or not) is unknown for the vast majority of the OCS.

It is possible oil spills from the Santa Barbara Channel may contact sea otter habitat in Central California. This could contribute to the irreversible impacts discussed in Central and Northern California.

b. Alternative I-2: The Proposed Schedule with Offerings of Favorable Geological Acreage

This option would retain the streamlining proposal but offer only the acreage of high potential. The environmental impacts that would result from this proposal will be essentially the same as those described under Alternative I-1 since the bulk of the analysis for Alternative I-1 was based on the assumption that only development of areas with high resource potential would occur. However, under Alternative I-1 some development may occur outside the high potential areas. The impacts that would result from this development discussed under Alternative I-1 would not occur under Alternative I-2. Translation into impact levels would not be very discernable.

THE MORE SIGNIFICANT ENVIRONMENTAL CONSEQUENCES

Southern California Resource Category	Level of Expected Impacts [1/] Scheduled Sales Only Under Alternative I-1	Cumulative Impacts of All Activities
1. General Impacts		
a. Water Quality and Supply		
Water Quality	low	moderate
Water Supply	high	very high
b. Navigation		
Ports and Harbors	low	moderate
Marine Traffic	moderate	high
c. Other Uses of the OCS		
Ocean Dumping	very low	very low
Military	moderate	moderate to high
Offshore Oil and Gas Infrastructure	low to moderate	moderate
d. Land Use (OCS-related Infrastructure)	low	low
e. Cultural Resources		
Offshore	low to moderate	moderate
Onshore	low	moderate
2. Impacts of Special Concern		
a. Coastal Ecosystems		
Intertidal	low to moderate	moderate to high
Subtidal Benthos	low to moderate	moderate to high
Wetlands	moderate	high
b. Commercial Fisheries		
Fish	low	high
Fisheries	moderate	high
c. Endangered & Threatened Species		
Endangered Species	moderate	very high
Threatened Species	low	low to moderate
d. Habitats and Resources of Special Concern		
Marine & Estuarine Sanctuaries	moderate	moderate to high
Designated Areas of Special Concern	low to moderate	moderate to high
Marine Mammals	moderate	moderate
Seabirds	moderate	moderate
e. Air Quality	low	moderate
f. Recreation & Tourism		
Coastal Recreation	moderate	moderate
Visual Resources	moderate	moderate
g. Socioeconomic Factors		
Employment	low	high
Population & Demography	low	high
Public Service & Facilities	low	high

1/ Definitions of level of impact are provided at the beginning of Section V.D.

(This table also applies to Alternatives I-2, II, and IV. See text.)

By limiting areal extent of possible leasing, subsequent environmental studies and analyses could concentrate on areas encompassing the acreage of high potential. However, as occurs under the present schedule, some studies and analyses would extend beyond the high potential areas in order to examine all impacts that may result from the schedule.

Restricting leasing to acreage of high potential also would have the advantage of reducing the area State and local governments have to consider when they plan for OCS activities.

c. Alternative II: The April 1981 Draft Schedule

Under Alternative II, the impacts to resources will be the same as described under Alternative I-1 with the exception of the description in Land Use (V.D.7.a.1)d)) and Public Services and Facilities (V.D.7.a.2)g)(3). Also under Alternative II, the same amount of leasing and development as described under Alternative I is expected to occur. The resource estimates, the development scenario (the number of wells and platforms and the timing of development), and the expected number of oil spills remains the same as in Alternative I. Under Alternative II the sale area (Southern California or Central and Northern California) is not designated in the schedule. Such designation would occur at the initiation of the leasing process for an individual sale. This delay in planning area designation may inhibit State and local efforts in planning for possible impacts by significantly reducing the lead or preparation time available to the jurisdiction. State planning law requires local jurisdiction to prepare a general plan and, where applicable, a local coastal plan (LCP). These plans must address community development, industrial expansion, and coastal dependent industries among other topics as well as provide for a capital improvement program (CIP). Additional specialized planning has been undertaken by local jurisdictions in response to earlier OCS sales, specifically Sales 48, 68 and 53. Lack of lead or preparation time may hinder the local jurisdiction's ability to update, implement, or initiate further plans. Impacts to existing oil- and gas-related infrastructure and the land use requirements for expansion of existing facilities is not considered significant as the infrastructure is already well developed in Southern California (see Section V.D.7.a.1)d)). Impacts to public services and facilities could range from low to high depending upon the service of facility affected and the amount of planning already accomplished by the local jurisdiction. For example, there may be high impacts to the water supply and treatment facilities of the Santa Barbara-Ventura area for increased OCS-related demands if opportunities cannot be identified sufficiently early in the process to initiate planning for expansion projects. Impacts to other services and facilities will be dependent upon the orientation of existing plans (general plans and LCPs) and existing capital improvement plans to provide expanded services for OCS-activity-induced population increases.

d. Alternative III-1: The Current Schedule, The Current System - No Action

The description of Alternative III-1 is provided in Section III.C.1. The data on resources, expected spills associated with the exploitation of the

resources, and the infrastructure required for resource development is reiterated in the subsections below as appropriate for individual resource categories.

The following discussion pertains to cumulative impacts and the contribution of Alternative III-1 to the cumulative impacts on resources in the planning area.

The resource estimates, expected spills, infrastructure, and timing of development for the cumulative impact case is also described in Section III. The estimates remain the same for each alternative described in this document as they are provided for total development of resources on the Federal OCS. The estimates include proven and unproven reserves, leased and unleased lands. In short, the estimates include all hydrocarbons predicted to occur within the entire planning area.

In addition to resource development on the Federal OCS, State Tidelands development and other existing and proposed projects (including crude import tankering, non-OCS activity-related population growth, military projects, sewage and other waste disposal, port expansion) all must be considered in an analysis of cumulative impacts on each resource category.

This has been done for the entire Southern California planning area and is provided for each resource category in Alternative I-1, Section V.D.7.a. Again, overall with all resources developed and existing and proposed projects and non-resource development activity considered, cumulative impacts to the resources are the same for each alternative. However, the contribution of the resource development from any specific alternative to the cumulative impacts in the planning area will vary.

Development resulting from continuing with the present schedule (Alternative III-1) is expected to contribute the following percentages of the total predicted, or cumulative, impacts to the Southern California planning area: less than 10 percent of the crude oil spills greater than 1,000 bbl and less than 8 percent of the crude oil spills greater than 10,000 bbl; less than 21 percent of the platforms; less than 22 percent of the exploration wells; and less than 28 percent of the development and production wells. In general, this contribution is not substantial but is expected to be low to moderate.

1) General Impacts

a) Water Quality and Supply

(1) Water Quality: Alternative III-1 may lead to water quality degradation in the Southern California OCS region due to the same impact agents as described for Alternative I-1 (Section 7.a.1)a)(1)). The level of impacts should be lower than the level expected from the first alternative because resources are estimated to be lower, but the expected impacts are still in the low range. The number of spills and volumes of routine discharges are lower than for Alternative I-1.

The number of statistically expected oil spills under Alternative III-1 is 1.1 for greater than 1,000 barrels in the Santa Barbara Channel, 0.9 for

greater than 1,000 barrels for the remaining Southern California area, 0.5 for greater than 10,000 barrels for the Santa Barbara Channel, and 0.4 for greater than 10,000 barrels for the remaining Southern California area. This is approximately one-half the number of spills in each of the two volume categories expected under Alternative I-1. The likelihood of impacts from oil spills is low and the level of impact is expected to be low in the Southern California planning area as a whole. The exception will be in the Santa Barbara Channel where an oil spill has a high probability of impact on water quality if it occurred near the Channel Islands. This would normally be a short-term impact (few days to few weeks); but if oil were entrained in nearshore sediments or kelp beds on the island margins, water quality could be degraded for much longer periods due to slow release of hydrocarbons into the water column. This impact would be significant given the pristine water around the Channel Islands and could have a high level of impact on endemic marine life there.

Drilling mud discharged into the Santa Barbara Channel will be 1.18×10^6 barrels and 8.64×10^5 barrels for the remaining Southern California area under Alternative III-1, 40 percent less than Alternative I-1. The volume for the channel is about one-sixth the volume of natural sediment input into the eastern end of the Channel each year. The mud will be dumped over the life of the development, about 10 years, and annual mud volumes will represent about 1/60 of the volume of natural sediments. The likelihood of this impact is very high (unless muds are barged ashore) but the level is expected to be very low given the volume and expected toxicity of drilling mud (see references cited in Section V.D.7.a.1)a)(1). Natural sediment input into the Southern California area outside of the Santa Barbara Channel is not known but is expected to exceed the natural input into the eastern end of the Channel. The lower volume of drilling muds expected to be discharged in the remaining Southern California OCS with the suspected higher volumes of natural sediments indicates very low level of impacts from muds in this area. The exceptions in both areas would occur in the deep basins of the borderland where muds could accumulate. The sediment characteristics of the basins could be changed by mud deposited there and benthic community structures could be changed. There is a moderate likelihood of mud sedimenting in these basins (e.g., Santa Barbara, Santa Cruz, Santa Monica, San Nicolas) but the extent of possible accumulation is unknown.

Drill cuttings will be discharged into the Santa Barbara Channel, 1.27×10^5 cu.yds., and area outside the Channel in Southern California, 9.36×10^4 cu.yds., (40 Percent less than Alternative I-1) and, as discussed for Alternative I-1, are not expected to cause significant impacts except within a few meters of the discharge point. The likelihood of this impact is high (routine dumping) but level of impact is very low (very limited sediment change around platform and no effect on water quality).

Formation water will be discharged during development under this alternative. The Santa Barbara Channel is expected to receive 2.74×10^8 barrels and the remaining OCS area 2.06×10^8 barrels of formation water (40 percent less than for Alternative I-1). These will be discharged during later stages of development of each field and will be diluted by the tremendous flow of the major current regimes in the region (California Current transport 10-12 x 10^6

m^3/sec). The impact on water quality is expected to be very low (see discussion Section V.D.7.a.1)a)(1)) while the likelihood of impact may be high (routine discharge into ocean under NPDES permit unless formation water is reinjected into oil strata).

Sewage discharge volumes for Alternative III-1 are 3.64 x 10^4 gallons per day for the Santa Barbara Channel and 2.52 x 10^4 gallons per day for the OCS area outside the Channel (40 percent less than Alternative I-1). The likelihood of impacts is high (routine discharges under EPA NPDES permits) but the level of impact is very low (minor nutrient enhancement immediately around platforms).

Sediment resuspension impacts are as described in Section V.D.7.a.1)a)(1) but at a lower level than for Alternative I-1 due to fewer platforms expected under Alternative III-1 (37 vs 22).

Conclusions. Water quality in the Southern California region would be degraded from activities associated with the proposed Alternative III-1. The level of impact is expected to be low for water quality in the region in its entirety. This is the same as Alternative I-1. The Santa Barbara Channel may experience low to moderate water quality impacts. Overall, the expected regional impacts on water quality are low.

(2) Water Supply: Impacts of this alternative will be considerably lower than those under the proposal. There will be an increase in the demand for water as a result of the development that would take place from adoption of this alternative. Water requirements will be 2,450 AFY (799.5 million gallons a year) for population increase, 1,850 AFY (43 percent) less than the proposal.

Under this alternative, facilities would require about 2,118 AFY of water (688.2 million gallons a year) for the estimated 680 exploratory and production wells. Water needs are about 39 percent of those described under the proposal.

Total water requirements under this alternative are estimated at about 4,568 AFY (1.5 billion gallons a year), 3,232 AFY (41 percent) less than the proposal. Area impacts would be about the same as those described under the proposal, but the level of impact should be significantly lower because there will be 411 fewer wells needed for exploration and development. Also, there will be a smaller population increase under this alternative. If this alternative is adopted, the likelihood of these impacts occurring is high unless water systems are improved.

Conclusions. OCS-related activities under this alternative will cause an increase in demand for water in Southern California by 4,568 AFY. This is significantly lower than the demand under the proposal. As it is the case under Alternative I-1, these additional water needs could put pressure on communities to develop methods to deal more effectively with potential water deficiencies. Overall, the expected regional impacts on water supply are moderate, considerably less than those under the proposal.

b) Navigation

(1) Ports and Harbors: The impacting agents on ports and harbors are oil spills and increased shipping activity. A discussion of these agents is presented in Section V.D.7.a.1)b)(1). Resource estimates for Alternative III-1 are approximately 40 percent less than those estimated for Alternative I-1. There will be correspondingly fewer oil spills that are predicted to occur. For Alternative III-1, it is expected that a total of 1.9 oil spills greater than 1,000 bbl and 0.9 oil spills greater than 10,000 bbl will occur. It is estimated that, of this total, 1.1 spills greater than 1,000 bbl and 0.5 spills greater than 10,000 bbl will occur within the Santa Barbara Channel. The remaining spills will occur outside the Channel. Despite the fewer expected spills, the level of impacts and likelihood of those impacts on ports and harbors from oil spills and increased shipping activity will be the same (low level) as those discussed for Alternative I-1.

Conclusions. The impacts associated with the adoption of Alternative III-1 on ports and harbors should not significantly differ from those discussed in Alternative I-1. Overall, the expected impacts on ports and harbors are low.

(2) Marine Traffic: Increased offshore infrastructure and marine traffic resulting from development of resources under III-1 will impact commercial marine traffic. A discussion of these impacting agents and the effects of these impacting agents is given in Section V.D.7.a.1)b)(2). Since the resource estimates for Alternative III-1 are approximately 40 percent less than those for Alternative I, there is correspondingly less new infrastructure and marine traffic. Exploration and development activities following the proposed lease sales, described in Alternative III-1, would result in an addition of 130 exploratory wells, 550 development/production wells, and 22 new platforms in the Southern California Federal OCS planning area. It is estimated that, of this total, 78 exploratory wells, 314 development/production wells, and 13 platforms will be placed in the Santa Barbara Channel. The remaining infrastructure will be placed outside the Channel.

Total infrastructure and exploration and development activities expected to result following adoption of Alternative III-1 are fewer in comparison to Alternative I, as previously discussed. Despite this difference, impacts on marine traffic in the Santa Barbara Channel will not differ significantly from those in Alternative I-1.

Outside the Channel, moderate impacts on marine traffic will also occur. However, the likelihood of these impacts is reduced from moderate to low. During peak periods of development (1985-1990), the likelihood of the impact would be moderate.

Conclusions. Impacts, and the likelihood of these impacts, associated with the adoption of Alternative III-1 on marine traffic should not differ significantly from those discussed for Alternative I-1 (i.e., moderate level impacts may occur). However, due to less expected activity, the likelihood of impacts on marine traffic outside the Santa Barbara Channel

is low rather than moderate. During the peak period of development, the probability of the impacts would be moderate rather than high. Overall, the expected impacts on marine traffic are moderate.

c) Other Uses of the OCS

(1) Ocean Dumping: The adoption of this alternative is expected to result in 22 platforms as opposed to the expected 37 platforms for Alternative I-1. The expected number of wells is accordingly lower. Of the expected platforms and wells, over half of them will be situated in the Santa Barbara Channel.

The likelihood of an impact occurring will be lower than those stated for Alternative I-1; however, any impact that does occur will remain as that listed for Alternative I-1 both in scope and effect.

Conclusions. The likelihood of an impact occurring will be very low. Overall, the expected regional impacts are very low as are the expected local impacts.

(2) Military Uses: Maintaining the present leasing schedule and tract selection system would have slightly lower impacts to military operations in comparison to the accelerated, area-wide proposed sale schedule (Alternative I-1). The amount of acreage of potential use conflict would be less than the proposal, allowing the interested parties to focus their concern and coordination efforts. The possibility of scattered oil industry activity away from areas of high resource estimates would be eliminated along with any future conflicts and impacts that would have resulted. Previously established mechanisms for coordination between the military and the oil industry interests would continue to be used.

The level of impact to military operations is still expected to be moderate, with Alternative III-1 development expected to bring 22 platforms to Southern California. The likelihood of impact is also expected to be moderate, with nine of those platforms anticipated outside the Santa Barbara Channel, where the military conducts extensive operations. If the standard military stipulations are effected, as in the past Pacific area OCS sales, impacts will be further reduced.

Conclusions. By maintaining the current leasing schedule, Alternative III-1, overall regional impacts to military operations remain moderate, even though slightly less impacts are expected in comparison to the proposal.

(3) Offshore Oil and Gas Infrastructure: Impacting agents on existing offshore oil and gas infrastructure are exploration and development activities and increased vessel activity (e.g., tankering, crew and supply boats, seismic vessels). A discussion of these agents is given in Section V.D.7.a.1)c)(3). Since resource estimates for Alternative III-1 are approximately 40 percent less than those for Alternative I-1, there will be correspondingly less new infrastructure and vessel activity. Exploration and development activities resulting from the implementation of Alternative III-1 would result in an addition of 130 exploratory wells, 550 development/ production wells, and 22 new platforms in the Southern

California area. It is estimated that, of this total, 78 exploratory wells, 314 development/ production wells, and 13 platforms will be placed in the Santa Barbara Channel. The remaining infrastructure will be placed outside the Channel. During periods of peak exploration and development activity (1985-1990), the level of impacts to offshore pipelines and subsea completion systems as a result of development activities in the Santa Barbara Channel would be the same (moderate) as those discussed for Alternative I-1. However, due to the difference in the level of activity following adoption of Alternative III-1 than from the adoption of the proposal, the likelihood of the impact would be low rather than moderate. During nonpeak years of development, the likelihood of impact would be low rather than very low. Impacts and the likelihood of those impacts on existing offshore pipelines and subsea completion systems outside the Santa Barbara Channel should be the same as those discussed for Alternative I-1.

Impacts on existing oil and gas infrastructure as a result of increased vessel activity within the Santa Barbara Channel should be the same (low level) as those discussed for Alternative I-1. However, due to the lesser amount of activity following adoption of Alternative III-1, the probability of the impact would be moderate rather than high. Impacts on infrastructure outside the Santa Barbara Channel should also be the same (low level) as those discussed for Alternative I-1. However, the likelihood of this occurrence is very low rather than low.

Conclusions. Expected impacts associated with the adoption of Alternative III-1 on existing offshore infrastructure as a result of development activities should be the same as those discussed for Alternative I-1. However, the likelihood of these impacts will decrease slightly.

d) Land Use: Impacts on land use from this alternative are somewhat less than those described for Alternative I-1 in Section V.D.7.a.1)d). This results from less (60 percent of Alternative I-1) OCS development and a lower demand for expansion of onshore OCS-related infrastructure.

Development of the resources associated with this alternative is likely to have a moderate effect on land availability in Santa Barbara-Ventura, while having an insignificant impact on regional land use. The impacts from this alternative are the same as those for Alternative I-1.

Conclusions. The impacts on land use from this alternative are expected to be moderate, the same as Alternative I-1, on the Santa Barbara-Ventura subregion. Regional level impacts are expected to be the same as those in Alternative I-1, low. Overall, the impacts from this alternative are low.

e) Cultural Resources

(1) Offshore Cultural Resources: The impact agents will be the same as discussed under Alternative I-1. However, since Alternative III-1 involves 40-60 percent fewer bottom-disturbing activities in comparison to Alternative I, there will be fewer impacts to submerged cultural resources. Alternative III-1 is expected to result in 22 platforms

and 680 wells in comparison to Alternative I-1's expected 37 platforms and 1,131 wells. There will also be fewer impacts from divers (less divers used from fewer platforms) and from magnetic anomalies (fewer platforms, pipelines and other sources of anomalies left on the ocean floor). It is assumed that there will be at least one pipeline per platform either to provide services or to transport hydrocarbons. Fewer platforms will result in correspondingly fewer pipelines. Concentration of development in the Santa Barbara Channel will also concentrate impacts to cultural resources in this part of the planning area because of the Channel's higher probability of containing submerged cultural resources. But the likelihood of occurrence will be much less than with Alternative I-1.

Use of the Cultural Resource Stipulation may reduce the level and likelihood of impacts to cultural resources by requiring remote sensing surveys prior to bottom-disturbing activities. Even with utilizing the cultural resource stipulation as in past sales, some loss to the resources is still expected because of equipment limitation and cultural resource detection difficulties.

Conclusions. The impacts to submerged cultural resources are expected to occur from the same causes as in Alternative I but with much less frequency and, therefore, result in lower impacts. Impacts will be concentrated in the Santa Barbara Channel area as over half the development is expected to occur in that area. The overall level of impact is expected to be low. Localized impacts may be moderate especially in the Santa Barbara Channel area.

(2) Onshore Cultural Resources: The impact agents for onshore cultural resources will be the same as in Alternative I (see Section V.D.7.a.1)e)(2)) but the probability of occurrence will be much less. Fewer proposed offshore developments will result in fewer expected in onshore-related developments, for example, the number of temporary construction sites, the need for facility expansion, the need for pipelines, etc. With fewer surface-disturbing activities under Alternative III-1, there will be a lower likelihood of impact to terrestrial cultural resources from OCS development. The probability of an oil spill of greater than 1,000 bbl is 1.9 and of a spill greater than 10,000 is 0.9. Thus, there is a lower probability of impacts from oil spills to subsistence and ceremonial intertidal gathering areas and to terrestrial sites during cleanup activities. Fewer platforms, only 22 in Alternative III-1 versus 37 in Alternative I-1, would result in fewer visual intrusions to Native American ceremonial sites and to sites listed in the National Register of Historic Places. Concentration of development in the Santa Barbara Channel even at a slower development pace may cause a similar concentration of onshore-related impacts. This may be very significant if development is concentrated near Point Conception, an area of known significance to Native Americans. It is assumed that State and local governments that have jurisdiction over OCS-related activities will require protection of terrestrial cultural resources in the permitting process. Impacts from Alternative III-1 are expected to be low throughout the region. Localized impacts may be moderate, especially in the Santa Barbara Channel area.

Conclusions. Impacts to terrestrial cultural resources are expected from the same sources as in Alternative I, that is, any surface-disturbing activity, visual intrusion and oil spills. Localized impacts may be moderate, especially in the Santa Barbara Channel area. ceremonial sites may be the same as in Alternative I. Overall, there will be a very low potential for impact to terrestrial cultural resources.

2) Impacts of Special Concern

a) Coastal Ecosystems:

(1) Intertidal: The impact agents to intertidal communities are oil spills and pipelines. A discussion of these agents and their impacts is given in Section V.D.7.a.2)a)(1). The number of 1,000 bbl or greater spills will be 1.9 spills fewer than the proposal and the number of 10,000 bbl or greater spills will be 0.9 in this alternative, or fewer than in the proposal. The impacts on intertidal areas will be less than those discussed in Alternative I-1. Impacts from spills should decrease to low, except for several special island sites where impacts may be high. The likelihood will be slightly less than in the proposal, but will remain high. This is because the majority of spills greater than 1,000 bbl (1.1 of 1.9) will occur from development in the Santa Barbara Channel where spills have a high probability of reaching the Channel Islands. Impacts from pipelines should remain low and the likelihood of such an impact should also remain high.

Conclusions. Impacts and their likelihood associated with the adoption of Alternative III-1 on intertidal communities should be less than those discussed for Alternative I-1. Overall, the level of expected regional impacts on intertidal communities is low. This is a reduction from the low to moderate impacts predicted for Alternative I-1.

(2) Subtidal Benthos: The impact agents to subtidal benthic communities are platforms and associated drilling muds and cuttings, oil spills and pipelines. A discussion of these agents and their impacts is given in Section V.D.7.a.2)a)(2). There will be 15 fewer platforms (22) if this alternative is adopted rather than the proposal (37). The number of 1,000 bbl or greater spills is 1.4 spills (3.3 to 1.9) fewer than Alternative I-1 and the number of 10,000 bbl or greater spills, 0.6 spills (1.5 to 0.9) fewer.

There may be a decrease in the likelihood (from low to moderate) to low of a high ecological loss to entire hard bottom benthic areas as a result of the reduced platforms because the decreased chance of locating several platforms on the same reef or areally limited hard bottom habitat. The platform-induced impacts to other benthic habitats will remain the same as discussed for Alternative I (e.g., low for the general surrounding area, but moderate in the immediate vicinity of the platforms).

All other impacts, both with respect to level and to likelihood, to the subtidal benthos will remain the same as those discussed for Alternative I-1. Although high impacts on hard bottoms are possible, impacts on both

hard and soft bottoms will typically be low; the likelihood is high. The likelihood of multiple spills on the same location and resulting moderate to high impacts (hard bottoms) remains high. Pipelines will still cause low impacts on soft bottoms and moderate to high impacts on hard bottoms with the likelihood of such impacts to occur being high.

Conclusions. Types of impacts associated with the adoption of Alternative III-1 on subtidal benthic communities should be the same as those discussed for Alternative I-1. Overall, the expected regional impacts on subtidal benthos are low. This is a reduction from the low to moderate prediction of Alternative I-1.

(3) Estuaries/Marshes/Wetlands: The impact agents to estuaries and wetlands are oil spills and onshore construction. A discussion of these agents and their impacts is given in Section V.D.7.a.2)a)(3). The expected number of 1,000 bbl or greater spills associated with the adoption of Alternative III-1 is 1.9 and the number of expected 10,000 bbl or greater spills is 0.9. This is roughly 58 percent less than for Alternative I-1.

The impacts on estuaries will be the same (high to very high) as those discussed for Alternative I-1. However, the likelihood of this occurrence is reduced marginally but remains low to moderate. The impacts on estuaries caused by onshore construction will remain the same both in terms of scope and likelihood as discussed for Alternative I-1. Overall, the expected regional impacts are moderate.

Conclusions. Impacts associated with the adoption of Alternative III-1 on estuaries and wetlands should be the same as those discussed for Alternative I-1. Overall, the expected regional impacts on estuaries and wetlands are moderate. This is the same as Alternative I-1.

b) Commercial Fisheries

(1) Fish: The expected numbers of oil spills associated with this alternative are 1.9 oil spills greater than 1,000 bbl and 0.9 oil spills greater than 10,000 bbl. This is roughly one-third less than the number of oil spills expected to result from Alternative I-1. Since surface fish populations (e.g., Pacific bonito, jack mackerel, northern anchovy, California grunion) are expected to be impacted each time there is a major oil spill, adoption of this alternative would result in surface fish populations being impacted one-third less often than with the adoption of Alternative I-1. Nevertheless, surface fishes are still expected to sustain low to moderate ecological losses each time there is a major oil spill.

Adoption of this alternative also would result in almost one-half the number of wells and platforms expected to result from Alternative I-1 and, therefore, the amount of man-made structures and drilling muds. However, the impacts of man-made structures and drilling muds on fish populations are unknown. Therefore, the changes in impacts from man-made structures and drilling muds if this alternative is adopted are unknown.

Overall, adoption of this alternative is expected to have the same regional impacts (low) on fish as Alternative I-1 since it is still likely that a few localized species will be impacted but most fish species will not be impacted.

Conclusions. Adoption of this alternative would result in surface fish populations (e.g., Pacific bonito, jack mackeral, northern anchovy, California grunion) being impacted at the same level as the adoption of Alternative I-1. Locally, these populations are still expected to sustain short-term low to moderate ecological losses. Overall, adoption of this alternative also is expected to have the same regional impacts (low) on fish as Alternative I-1.

(2) Commercial Fisheries: The expected numbers of oil spills associated with this alternative are one-third less than the number of oil spills expected to result from Alternative I-1. The lower number of oil spills associated with this alternative would result in a lower likelihood that a large oil spill would occur in prime fishing grounds and, therefore, that commercial fisheries would sustain short-term moderate to high economic losses. However, since 1.9 oil spills greater than 1,000 bbl are expected from this alternative, the losses described above still are expected to occur.

Adoption of this alternative also is expected to result in 22 platforms. This is almost one-half the number of platforms expected to result from Alternative I-1. The lower number of platforms associated with this alternative would result in a lower likelihood that several platforms would be placed within prime trawling grounds and, therefore, that the commercial trawl fishing industry would experience moderate economic losses due to preclusion of fishing space. However, since 13 platforms are expected to be placed in the Santa Barbara Channel from this proposal, the losses described above are still expected to occur.

The number and length of pipelines that will result from the proposal are unknown. However, since adoption of this alternative would result in about half the number of platforms than are expected to result from Alternative I-1, this alternative probably also would result in half the number of pipelines. Therefore, adoption of this alternative would result in a lower likelihood that pipelines would be placed in important fishing areas and, therefore, that the commercial trawl fishing industry would experience high economic losses. However, these losses still are expected to occur from this alternative.

Other impacts on commercial fisheries are not expected to be significantly different from Alternative I-1. Overall, adoption of this alternative is expected to have the same regional impacts on the commercial fishing industry as Alternative I-1 since it is still likely that some but not all commercial fisheries will be impacted.

Conclusions. Overall, adoption of this alternative is expected to have the same regional (moderate) impacts on the commercial fishing industry as Alternative I-1.

c) Endangered and Threatened Species

(1) Endangered Species: The number of spills predicted from Southern California OCS activities under Alternative III-1 are 1.9 spills greater than 1,000 bbl and 0.9 greater than 10,000 bbl, about 60 percent of those expected under Alternative I-1. A little more than half of these spills are expected to occur in the Santa Barbara Channel. The expected number of platforms is also less than in the proposal (37 versus 22). Impact agents and resources are the same as in Alternative I-1. The effects of oil spills and platforms on the various species will remain the same only the probability of an impact from an oil spill is less. The fewer platforms and less related OCS activities than in Alternative I-1 is not considered significant in reducing potential noise and disruption impacts. Drill effluent impacts remain uncertain.

The level of impacts for endangered species are, therefore, the same as in the proposal. The likelihood of impacts is slightly less but remains the same except for the great whales. The probability of an oil spill impacting great whales is moderate rather than high due to fewer predicted spills. See Section V.D.7.a.2)c)(1) for a discussion of impacts.

Great whales' impacts will remain low to moderate from oil but with a moderate rather than high likelihood. Noise impacts will remain moderate with a moderate likelihood. Brown pelicans still may sustain high impacts from both oil spills and noise; the likelihood also remains low. Rails and least terns may still sustain high to very high impacts locally, but the likelihood is slightly reduced from the low to moderate range to the low range. Sea turtles remain at an impact level; the likelihood is reduced from moderate to low. Overall, all the expected regional impacts are moderate for great whales and low for other species.

Exploration and development under Alternative III-1 will proceed more slowly than under Alternative I-1. For almost all marine endangered and threatened species, the level of information currently available is very low. Basic physiology and behavior is just beginning to be studied in relationship to oil toxicity, effects of drilling effluents and noise, contact effects of oil and the effects on food sources of OCS oil activities.

The slower development schedule proposed under Alternative III-1 potentially allows research to be carried out during the life of the Schedule to more nearly determine the biology of marine animals and propose actions which may mitigate (reduce) impacts.

Conclusions. The level of impacts will remain the same as in Alternative I-1. The likelihood of impacts is slightly reduced. Overall, the impacts are expected to remain moderate for great whales and low for other species. Overall regional impacts are expected to remain moderate.

(2) Threatened Species: See the section above for a discussion of the number of spills and platforms expected under this alternative.

Impact agents and resources are the same as in Alternative I-1. The effects of oil spills and platforms on the various species will remain the same, only the probability of an impact from an oil spill is less. The fewer platforms and less related OCS activities than in Alternative I-1 is not considered significant in reducing potential noise and disruption impacts. Drill effluent impacts remain uncertain.

Expected impacts to the southern sea otter remain moderate if a colony is hit by an oil spill. The likelihood of this occurrence is very low, slightly less than the low predicted for Alternative I-1. Possible impact levels to the guadalupe fur seal are moderate from oil spills and high from noise and disruption under both Alternative I-1 and III-1. The likelihood of these occurrences is low. Overall, the regional expected impacts to both species are expected to be low as in Alternative I-1. See Section V.D.7.a.2)c)(2) for a more detailed discussion of impacts to the southern sea otter and guadalupe fur seal in Southern California.

See the preceding section for a discussion of the potential advantages afforded by the slower development schedule expected in Alternative III-1.

Conclusions. Potential impacts to threatened species are the same in Alternative III-1 as in Alternative I-1. Although unlikely the otter may sustain moderate impacts from oil; the guadalupe fur seal, moderate impacts from oil and high impacts from noise. Overall, the regional impacts to both species is expected to remain low.

d) Habitats and Resources of Special Concern

(1) Marine and Estuarine Sanctuaries: The impact agents to the Channel Islands National Marine Sanctuary are oil spills, platforms and pipelines. A discussion of these agents and their impacts is given in Sections V.D.7.a.2)a)(1), V.D.7.a.2)a)(2), and V.D.7.a.2)d)(1).

Fifteen fewer platforms are expected if this alternative is adopted rather than the proposal (37 to 22). The number of 1,000 bbl or greater spills expected to result from the adoption of Alternative III-1 is 1.9 and the number of 10,000 bbl or greater spills is expected to be 0.9 from this alternative. This is over 50 percent less than are expected for Alternative I-1. The level of impacts on the marine sanctuary will be the same as those discussed for Alternative I-1. Although there is a possibility of high impacts on hard bottoms, oil spill impacts to both hard and soft bottoms will typically be low. The likelihood of these impacts will be high.

Impacts from spills on the intertidal habitats of the marine sanctuary should remain low to moderate, except to parts of the northern coast of Santa Rosa Island where impacts may be high because of the abundant algae (*Pelvetia*) beds located here.

If the NOAA findings permit drilling within the sanctuary, the likelihood that the oil industry will do so remains high. The impacts will remain moderate to high in the immediate vicinity of the platform, but low, moderate or high in the general area of the platform (see Section V.D.7.a.2)a)(2)).

Pipelines will cause low impacts on soft bottoms and moderate to high impacts on hard bottoms. The likelihood of these impacts occurring within the Santuary also depends on the NOAA decision to permit operations within the sanctuary. The likelihood of these impacts occurring if drilling is permitted should be high.

Conclusions. Impacts and their likelihood associated with the adoption of Alternative III-1 on the Channel Islands National Marine Sanctuary should be the same as those discussed for Alternative I-1. Overall, the expected regional impacts on the Channel Islands National Marine Sanctuary are moderate. This is the same as Alternative I-1.

(2) Designated Areas of Special Concern: The impact agents to intertidal and shallow subtidal communities within the designated areas of special concern are oil spills and pipelines. A discussion of these agents and their impacts is given in Section V.D.7.a.2)a)(1), V.D.7.a.2)a)(2) and V.D.7.a.2)d)(2).

The number of 1,000 bbl or greater spills expected under Alternative III-1 is 1.4 spills less than in Alternative I (3.3 to 1.9) and the number of 10,000 bbl or greater spills is expected to be 0.6 spills less (1.5 to 0.9) in this alternative relative to Alternative I-1. The impacts on intertidal and shallow subtidal benthic areas will remain the same as those discussed in Alternative I-1. Impacts from spills should remain low to moderate, except for several special intertidal island sites where impacts may be high. The likelihood will be slightly less, but will remain high. This is because the majority of spills (1.1 of 1.9) will occur from development in the Santa Barbara Channel where spills have a high probability of reaching the Channel Islands.

Impacts from pipelines on the designated special areas are not expected to occur because of the high degree of concern placed upon them by the State of California.

Conclusions. Impacts and their likelihood associated with the adoption of Alternative III-1 on designated areas of special concern should be the same as those discussed for Alternative I-1. Overall, the expected regional impacts on designated areas of special concern are low to moderate. This is the same prediction as Alternative I-1.

(3) Marine Mammals: The number of spills predicted from Southern California OCS activities under Alternative III-1 are 1.9 spills greater than 1,000 bbl and 0.9 greater than 10,000 bbl, about 60 percent of those expected under Alternative I-1. A little more than half of these spills are expected to occur in the Santa Barbara Channel. The expected number of platforms is also less (37 versus 22).

Impact agents and resources are the same as in Alternative I-1. The effects of oil spills and platforms on the various species will remain the same, only the probability of an impact from an oil spill is less. The fewer platforms and less related OCS activities than expected for the proposal is not considered significant in reducing potential noise and disruption

impacts primarily because a large portion of the OCS activity is still expected to occur in the Santa Barbara Channel. Drill effluent impacts remain uncertain.

In the case of marine mammals in Southern California, even though the likelihood of impacts was slightly less in all cases, it was not sufficiently less to change likelihood categories. Therefore, the following levels and likelihoods are the same in Alternative I-1 and III-1. Breeding pinnipeds (seals and sea lions) have a moderate likelihood of moderate impacts from oil spills and a low likelihood of high impacts from noise and human disruptions. Other pinnipeds have a moderate likelihood of low impacts. Cetaceans (whales, porpoises and dolphins) have a high likelihood of low to moderate impacts from oil and a moderate likelihood of moderate impacts from platform noise. See Section V.D.7.a.2)d)(3) for a more detailed discussion of impact agents and levels. Overall, the regional expected impacts are the same for both alternatives, i.e., moderate.

Exploration and development under Alternative III-1 will proceed more slowly than under Alternative I-1. For biological resources, the more moderate development rate is preferable. For almost all marine, endangered and threatened species, the level of information currently available is very low. Basic physiology and behavior is just beginning to be studied in relationship to oil toxicity, effects of drilling effluents and noise, contact effects of oil and the effects on food sources of OCS oil activities.

The slower development schedule proposed under Alternative III-1 will potentially allow research to be carried out to more nearly determine the biology of marine animals and propose actions which may mitigate (reduce) impacts. In this sense, the slower rate of development proposed under Alternative III-1 may be highly favorable to the continued health and survival of the marine mammals discussed above.

Conclusions. Impact levels and likelihood are the same for Alternatives III-1 and I-1. The overall expected regional impacts to marine mammals are moderate as in the proposal.

(4) Seabirds: The number of spills predicted from Southern California OCS activities under Alternative III-1 are 1.9 spills greater than 1,000 bbl and 0.9 greater than 10,000 bbl, about 60 percent of those expected under Alternative I-1. A little more than half of these spills are expected to occur in the Santa Barbara Channel. The expected number of platforms is also less than are predicted for the proposal (37 versus 22).

Impact agents and resources are the same as in Alternative I-1. The effects of oil spills and platforms on the various species will remain the same, only the probability of an impact from an oil spill is less. The smaller number of platforms and related OCS activities is not considered significant in reducing potential noise and disruption impacts primarily because a large portion of the OCS activities are still expected to occur in the Santa Barbara Channel. Drill effluent impacts remain uncertain.

The levels of impacts below are the same for both Alternatives III-1 and I-1. With the exception of oil impacts to nesting seabirds, the likelihoods have also remained the same since the difference was insufficient to warrant a change in likelihood categories. Nesting seabirds have a low (compared to moderate for Alternative I-1) likelihood of a moderate to high impact from an oil spill and low probability of a high impact from noise and human disruption. Migrating seabirds have a moderate likelihood of low to moderate impacts. See Section V.D.7.a.2)d)(4) for a more detailed discussion of impact agents and levels. Overall, regional expected impacts to seabirds are low; this is lower than expected under Alternative I-1 because the moderate to high impacts to nesting seabirds are no longer expected.

See the preceding section for a discussion of the potential advantages afforded by the slower development schedule expected in Alternative III-1.

Conclusions. Regional impact levels to seabirds are expected to be low rather than moderate as they are for Alternative I-1.

e) Air Quality: One hundred and thirty exploratory wells, 550 development/production wells and 22 platforms are forecast under this alternative in order to describe and develop the resources. This is significantly less than expected for the proposal. The likely location of the platforms remains the same as Alternative I-1, within 20 miles of shore. Also as with the proposal, no new gas processing plants or refineries are forecast.

Conclusions. The overall level of expected impacts is low, as for the proposal.

f) Recreation and Tourism

(1) Coastal Recreation: The adoption of this alternative will result in fewer anticipated oil spills than for Alternative I-1: 1.9 spills greater than 1,000 barrels and 0.9 spills greater than 10,000 barrels. Of these spills, 1.1 greater than 1,000 barrels and 0.5 greater than 10,000 barrels are anticipated to occur in the Santa Barbara Channel. This is approximately two-thirds of the number expected for Alternative I-1 and will result in a low likelihood of impact to the region. However, any impact that does occur will have the same effect as those stated for Alternative I-1 (Section V.D.7.a.2)f)(1)).

The number of expected platforms associated with this alternative is 22, with 13 of these situated in the Santa Barbara Channel. This is approximately two-thirds the number of platforms expected for Alternative I-1 and will result in a lower level of likelihood than stated for Alternative I-1. However, any impact that does occur will remain as stated for Alternative I-1 (Section V.D.7.a.2)f)(1)).

Conclusions. Overall, the expected regional impacts are moderate, the same as for the proposal.

(2) Visual Resources: The adoption of this alternative will result in a lower number of anticipated oil spills than for Alternative

I-1: 1.9 spills greater than 1,000 barrels and 0.9 spills greater than 10,000 barrels. Of these spills, 1.1 greater than 1,000 barrels and 0.5 greater than 10,000 barrels are anticipated to occur in the Santa Barbara Channel. This is approximately two-thirds of the number expected for Alternative I-1 and will result in a lower likelihood of impact to the region than was stated for Alternative I-1. However, any impact that does occur will have the same effect as those stated for Alternative I-1 (Section V.D.7.a.2)f)(2)).

The number of expected platforms associated with this alternative is 22, with 13 of these situated in the Santa Barbara Channel. This is approximately two-thirds of the number of platforms expected for Alternative I-1 and will result in a slight reduction in level of likelihood of impact from what is stated for Alternative I-1. However, any impact that does occur will remain as stated for Alternative I-1.

Conclusions. The likelihood of impact occurring from this alternative is slightly lower than that stated for Alternative I-1; however, the localized impacts, if they occur, will remain high as stated for Alternative I-1. Overall, the expected regional impacts are moderate.

g) Socio-economic Factors: The impact agents for this alternative are the same as that described in Section V.D.7.a.2)g).

(1) Employment: Employment from this alternative would be approximately 57 percent of the increase from Alternative I-1. More than half of the 7,400 additional jobs generated by this alternative are expected to be in the Santa Barbara-Ventura subregion. This alternative will continue the shift in employment towards OCS activities in Santa Barbara-Ventura, while having no appreciable impact on the economic structure of the Southern California region.

Conclusions. The impacts on a regional level are small, but to the Santa Barbara-Ventura subregion the impacts are expected to be moderate, as they are for Alternative I-1. Overall, the impacts from this alternative are low as for Alternative I-1.

(2) Population and Demography: Population is anticipated to increase by 12,300 as a result of this alternative, or 57 percent of the anticipated increase in population resulting from Alternative I-1. More than 50 percent of the anticipated increase in population is expected to locate in Santa Barbara-Ventura.

Full development of the resources associated with this alternative is expected to result in a change in population between 9,800 and 13,400. Overall, the impact from this alternative will be very low.

Conclusions. Regional impacts are expected to be less significant than they are for Alternative I-1. Impacts to the Santa Barbara-Ventura subregion are expected to be low as opposed to the moderate impacts expected to result from the adoption of Alternative I-1. Overall, the impact from this alternative will be very low.

(3) Public Facilities and Services: The impacts from this alternative are reduced from those associated with Alternative I-1 because of the lower levels of population and economic activity resulting from this alternative. On the regional level, water supply is expected to be impacted at a low level while no other public facilities or sources are expected to be significantly impacted. Santa Barbara-Ventura will suffer moderate impacts on water supply, sewage treatment, schools, and local finances and economies.

<u>Conclusions</u>. Impacts on public facilities and services in Santa Barbara-Ventura are moderate, while on a regional level only, water supply is impacted significantly. Regional impacts are the same as I-1, low; however, the impacts on Santa Barbara-Ventura are low as opposed to the moderate impacts of Alternative I-1. Overall, impacts from this alternative are low.

3) Impacts on Other Management Plans: Impacts are as described in Section V.D.7.a.3).

4) Unavoidable Adverse Impacts: Impacts are as described in Section V.D.7.a.4).

5) Relationship Between Short-Term Uses of Man's Environ ment and Long-Term Productivity: Relationships are as described in Section V.D.7.a.5).

6) Irreversible and Irretrievable Commitment of Resources: Commitment of resources is as described in Section V.D.7.a.6).

e. Alternative III-2: Current (June 1980) Schedule - Offering Greater Acreage per Sale

The level of expected impacts following the implementation of Alternative III-2 does not significantly differ from those discussed in Alternative III-1.

The estimated hydrocarbon resources for Alternative III-2 in Southern California are as follows: 0.63 billion barrels oil and 1.08 trillion cubic feet gas. Infrastructure expected to be used to explore and develop these resources include 150 exploratory wells and 26 platforms. The predicted oil resources and infrastructure for this alternative are approximately one-third less than those predicted for Alternative I. Gas resources are about 30 percent less than Alternative I estimates. It is expected that 2.3 oil spills greater than 1,000 bbl and 1.1 oil spills greater than 10,000 bbl will occur following the implementation of Alternative III-2. Again, expected oil spills are about 30 percent less than that described for Alternative I. The prediced resources, infrastructure and oil spills for Alternative III-2 are about 15 percent higher (exploratory wells will be 13 percent higher) than those predicted for Alternative III-1. Although the resources, infrastructure, and oil spills are higher in Alternative III-2, significant differences in impacts cannot be differentiated from those described in Alternative III-1.

THE MORE SIGNIFICANT ENVIRONMENTAL CONSEQUENCES

Southern California Resource Category	Level of Expected Impacts 1/ Scheduled Sales Only Under Alternative III-1	Cumulative Impacts of All Activities
1. General Impacts		
a. Water Quality and Supply		
Water Quality	low	moderate
Water Supply	moderate 2/	very high
b. Navigation		
Ports and Harbors	low	moderate
Marine Traffic	moderate	high
c. Other Uses of the OCS		
Ocean Dumping	very low	very low
Military	moderate	moderate to high
Offshore Oil and Gas Infrastructure	low 2/	moderate
d. Land Use (OCS-related Infrastructure)	low	low
e. Cultural Resources		
Offshore	low 2/	moderate
Onshore	low	moderate
2. Impacts of Special Concern		
a. Coastal Ecosystems		
Intertidal	low 2/	moderate to high
Subtidal Benthos	low 2/	moderate to high
Wetlands	moderate	high
b. Commercial Fisheries		
Fish	low	high
Fisheries	moderate	high
c. Endangered & Threatened Species		
Endangered Species	moderate	very high
Threatened Species	low	low to moderate
d. Habitats and Resources of Special Concern		
Marine & Estuarine Sanctuaries	moderate	moderate to high
Designated Areas of Special Concern	low to moderate	moderate to high
Marine Mammals	moderate	moderate
Seabirds	low 2/	moderate
e. Air Quality	low	moderate
f. Recreation & Tourism		
Coastal Recreation	moderate	moderate
Visual Resources	moderate	moderate
g. Socioeconomic Factors		
Employment	low	high
Population & Demography	very low 2/	high
Public Service & Facilities	low	high

1/ Definitions of levels of impact are provided at the beginning of Section V.D.

2/ Differs from the proposal.

THE MORE SIGNIFICANT ENVIRONMENTAL CONSEQUENCES

Southern California Resource Category	Level of Expected Impacts 1/ Scheduled Sales Only Under Alternative III-2	Cumulative Impacts of All Activities
1. General Impacts		
a. Water Quality and Supply		
Water Quality	low	moderate
Water Supply	moderate 2/	very high
b. Navigation		
Ports and Harbors	low	moderate
Marine Traffic	moderate	high
c. Other Uses of the OCS		
Ocean Dumping	very low	very low
Military	moderate	moderate to high
Offshore Oil and Gas Infrastructure	low 2/	moderate
d. Land Use (OCS-related Infrastructure)	low	low
e. Cultural Resources		
Offshore	low 2/	moderate
Onshore	low	moderate
2. Impacts of Special Concern		
a. Coastal Ecosystems		
Intertidal	low 2/	moderate to high
Subtidal Benthos	low 2/	moderate to high
Wetlands	moderate	high
b. Commercial Fisheries		
Fish	low	high
Fisheries	moderate	high
c. Endangered & Threatened Species		
Endangered Species	moderate	very high
Threatened Species	low	low to moderate
d. Habitats and Resources of Special Concern		
Marine & Estuarine Sanctuaries	moderate	moderate to high
Designated Areas of Special Concern	low to moderate	moderate to high
Marine Mammals	moderate	moderate
Seabirds	low 2/	moderate
e. Air Quality	low	moderate
f. Recreation & Tourism		
Coastal Recreation	moderate	moderate
Visual Resources	moderate	moderate
g. Socioeconomic Factors		
Employment	low	high
Population & Demography	very low 2/	high
Public Service & Facilities	low	high

1/ Definitions of levels of impact are provided at the beginning of Section V.D.

2/ Differs from the proposal.

f. Alternative IV-a: Delete 7 Alaska Sales, Change the Timing of Others Using Area-wide Offerings

The impacts from this alternative in Southern California are identical to those described for Alternative I-1.

g. Alternative IV-1.b: Delete 7 Alaska Sales, Change the Timing of Others Offering Favorable Geological Acreage

The impacts from this alternative in Southern California are identical to those discribed for Alternative I-1.

h. Alternative IV-2.a: Delete All Arctic Planning Areas From the Schedule While Using Planning Area-wide Offerings

The impacts from this alternative in Southern California are identical to those described for Alternative I-1.

i. Alternative IV-2.b: Delete All Arctic Planning Areas From the Schedule While Offering Favorable Geological Acreage

The impacts from this alternative in Southern California are identical those described for Alternative I-1.

8. Central and Northern California

a. Alternative I-1: The Proposed Schedule with Area-Wide Offerings

The description of the proposal, Alternative I-1, is provided in Chaper III of this document. The data on estimated oil and gas resources, the statistically expected number of oil spills associated with the development of the resources, and the infrastructure required for resource development are reiterated in the subsections below as appropriate for the individual resource categories.

The analysis of impacts associated with the adoption of Alternative I-1 is principally based upon the assumption that only areas with favorable geologic characteristics (most favorable areas or most likely areas) will be leased and subsequently developed. The impacts related to Alternatives I-1 and I-2 are therefore essentially identical. There is, however, a possibility that resource development could occur outside the most likely areas if the area-wide leasing approach (Alternative I-1) is adopted since oil companies may choose to bid on these areas. Such development is expected to be the exception rather than the rule and is not expected to result in impacts significantly different from those described in this section. Definitions of terms used to describe level of impact (very high to very low) are provided at the beginning of Section V.D.

1) General Impacts

a) Water Quality and Supply

(1) Water Quality: Water quality in Central and Northern California OCS will be subject to impact from oil and gas exploration and development activities. Water quality is currently very good for most of the region (the exception is near San Francisco) with river runoff being the dominant source contributing onshore materials.

The brief discussion which follows regarding the levels of various impact agents associated with OCS activity must be qualified. A low level of impact for water quality may indicate that the existing water quality is such that the proposed activity will not substantially alter quality or cause any significant degree of change in biota. This may occur in two ways: a) the existing condition is degraded to such an extent that the added pollutant burden will not significantly further degrade the quality or b) the existing condition is very good to excellent and the added pollutant burden is small enough to be easily accommodated by the system. The latter is the case for the Central and Northern California region. It does not imply necessarily that the added pollutants are not significantly above preactivity concentrations.

The discussion of impact agents which may cause degradation of water quality in Central and Northern California areas (oil spills, drilling muds, drill cuttings, formation water, sewage, and sediment resuspension) remains the same as for Southern California. The proposal calls for two sales in the Central and Northern California planning area and lower resources are estimated there than for Southern California. There are 2.0 spills greater than 1,000

barrels and 1.0 spills greater than 10,000 barrels statistically expected. The level of impact to water quality is expected to be somewhat higher for individual spills in Central or Northern California compared to Southern California due to cleaner water in the northern part of the OCS. The dynamic nature of the region's physical oceanography, that is, its high and frequent waves and storm conditions, would tend to disperse or remove oil from the environment quickly. Therefore, overall impacts from oil spills is expected to be low (limited number, extent, duration, and good chances for recovery) in this planning area. The exceptions to this are spills occurring in or near bays or estuaries where the level of impact would be very high for water quality.

Drilling mud and cuttings will be discharged into the ocean in this region as in Southern California. A total of 1.67×10^6 barrels of mud is expected to be discharged and 1.53×10^5 cu. yds. of cuttings dumped. Given the relatively narrow shelf, probability of offshore sediment transport, and dynamic physical conditions, and evidence presented at the 1980 Drilling Fluid Symposium for areas with strong currents, the level of impacts from muds to water quality is expected to be very low for the region and low for the local water quality near discharge points. The indirect effects of drilling muds and cuttings may pose higher impacts to benthic and a few species of shallow subtidal marine organisms in areas not subject to high sedimentation. However, the benthic fauna and flora, except for commercial and sports fish, are relatively unknown for most of the shelf (some data are available for Bodega, Monterey, Tomales, Morro, and San Francisco Bays) and it is unknown what sensitive species may exist.

Formation water will be discharged into the ocean in an expected volume of 3.89×10^8 barrels. The impact to water quality will be similar to that in Southern California and is expected to be very low for the region as a unit and low level around discharge points.

Domestic sewage, kitchen and bathroom wastes will be discharged at a volume of 5.32×10^4 gallons per day. The impact of these effluents is expected to be very low (no noticeable effect on water quality at a distance of greater than several hundred feet).

Sediment resuspension from platform placement and pipeline burial will impact water quality due to turbidity. The level of impact is expected to be very low and localized near the disturbance and of short duration.

Conclusions. The water quality in the Central and Northern California planning area would be degraded to a slight degree from activities associated with the proposed alternative. The level of impact is expected to be low for water quality in the region but at least moderate for water quality near the points of activities (spills, discharges). The likelihood of all impacts is high (routine discharges). Overall, the expected regional impacts on water quality are low.

Cumulative Impacts. The proposed lease schedule (Alternative I-1) will have cumulative impacts to water quality along with production from existing leases and leases beyond the proposal on the OCS, municipal sewage discharges now operating and planned, ocean dumping (near Farallon Islands), State Tidelands oil and gas development, tankering of crude oil into the region and increased vessel traffic from expansion of Port

San Luis and Avila Bay. The magnitude of these cumulative effects is difficult to estimate at this time, however, it is expected that ocean dumping near the Farallon Islands (radioactive wastes) and the expansion of the ports will contribute little to overall cumulative effects in the Central and Northern California planning region. The municipal sewage outfall constructed south of San Francisco will add several hundred million gallons of sewage to the marine environment per day if full operation is achieved. This will add significant amounts of trace metals and hydrocarbons to the ocean in a region of pristine water. OCS activity near the outfall area could lead to significant impacts to water quality when combined with sewage outfall pollutant burden.

The other major source of cumulative impacts with this proposal is the expected spills and discharges from OCS activity on presently leased tracts in the Santa Maria Basin (Sale No. 53) and any future lease sales and post-sale activity in the Central and Northern California planning region. In the unlikely event that all Federal OCS tracts offshore Central and Northern California are leased and all resources developed over the life of the proposal (total resource development), the cumulative volumes of expected discharges and cumulative number of expected spills of crude oil from Federal OCS development and import tankering of crude oil are given in the following table (Table V.D.8.a.1)a)(1)-1.).

Water quality will suffer impacts from the cumulative oil spills expected in Central and Northern California. The level of impact is estimated to be moderate to high in most of the pristine waters of the region but only for a short time and only to a limited extent for most spills. Cumulative spill impacts would be low to moderate in the area near San Francisco for already degraded water quality. Water quality and, indirectly, marine organisms (from smothering and sediment change effects) are expected to see moderate level impacts from cumulative drilling muds and cuttings in the region. This estimation of impact could be revised if information on natural sediment deposition and transport becomes available and if data on State Tidelands oil and gas development becomes available. This could be especially important in South Central California. Formation water cumulative effects should be low level for the planning area considered as a unit and low to moderate for near discharge point water quality. It is expected that water column and sediment levels of trace metals (and to a lesser extent hydrocarbons) will be elevated significantly due to cumulative discharges of drilling fluids and formation water. However, the overall impact except to sensitive species of marine life should be as described, given the suspected ability of the regional environment to accommodate the expected volumes of pollutants distributed over time and space. Cumulative effects of sewage are expected to be very low for the region with the exception of the area adjacent to the San Francisco municipal outfall. Overall, the expected regional cumulative impacts on water quality are moderate.

Oil spills, drilling mud, drill cuttings, formation water, and sewage are among the significant impact producing agents on water quality. The proposal contributes less than 14 percent of the oil spills greater than 1,000 bbl, less than 12 percent of the oil spills greater than 10,000 bbl, less than 54 percent of the drilling mud, less than 54 percent of the drill cuttings, and less than 54 percent of the formation water. The proposal substantially contributes to the cumulative impacts of OCS activity on this resource.

With the consideration of non-OCS-related population growth and associated sewage discharge, the proposal is not an important contribution to area water quality degradation whether cumulative impacts include development of all resources offshore Central and Northern California (total resource development), or only resources described for the alternative currently leased lands, and non-OCS related projects and proposals.

TABLE V.D.8.a.1)a)(1)-1
CUMULATIVE SPILLS AND DISCHARGES
CENTRAL AND NORTHERN CALIFORNIA PLANNING AREA

	Spills (No.)	Drilling Mud (bbls)	Drill Cuttings (cu.yds.)	Formation Water (bbls)	Sewage (gals/day)
Oil and Gas	14.0 ≥ 1,000 bbl* 8.1 ≥ 10,000 bbl**	3.06×10^6	2.81×10^5	7.15×10^8	9.5×10^4

* 3.6 spills greater than 1,000 bbls are expected from development of all OCS hydrocarbon resources in the planning area and 10.5 spills greater than 1,000 bbls from import crude tankering from Alaskan and foreign sources.

** 1.9 spills greater than 10,000 bbls are expected from development of all OCS hydrocarbon resources in the planning area and 6.3 spills greater than 10,000 from import crude tankering.

(2) Water Supply: Adoption of this alternative will place demands on local water supply systems as a result of population changes and industry activities originating from OCS hydrocarbon development. Fresh water use can be estimated as a direct function of population. The average person uses about 65,000 gallons of water per year. Fresh water needs for OCS-related facilities are estimated depending on the type of activity. An exploratory well requires about 1.2 million gallons of water per year, while a production well only requires 970,000 gallons. At least one-third of the water must be potable (Blayney-Dyett, 1981, POCS Technical Paper No. 81-4; NERBC-RALI, 1976, Onshore Facilities Related to Offshore Oil and Gas Development). Gas processing plant water requirements vary depending on the type of cooling system used. It is assumed that closed cooling systems, which consume insignificant amounts of water, would be used throughout the project.

Water is usually provided locally and can comprise a significant portion of municipal or district budgets. Central and Northern California's water supply comes from surface water and local groundwater basins. Water supplies are considered adequate for existing and some additional development in most parts of planning area. In parts of Central California, surface water supplies are 70 percent depleted in a dry year. In some areas, this level of depletion is attained in an average year. Groundwater wells experience significant overdraft in parts of Central California, while in the rest of the planning area this problem is not considered major. There are questions

about the adequacy of future water supplies in many areas. The need for improvement and expansion of existing water systems is widely recognized. However, current limited financial capability only allows local governments to be aware of the potential water problems which could develop if increased economic activity occurs.

Population gains caused by OCS-related growth in employment opportunities will increase the demand for water. Population increase associated with the proposal is discussed in Section V.D.8.a.2)g)(2). Population water needs would be about 3,290 AFY (1.0 billion gallons) throughout the region. Facilities would require 1,712 AFY (558 million gallons) of water, which would maintain 555 exploratory and production wells. The likelihood of these needs occurring depends on the continued level of water consumption by the different users involved. These changes are expected to result in regional impacts.

Conclusions. Water supplies would be affected as a result of this proposal. Some improvement and expansion of existing water systems could be necessary to accommodate OCS facilities and population water requirements. Central California will experience higher impacts than the rest of the planning area. Overall, the expected regional impacts are moderate.

Cumulative Impacts. In the unlikely event that all tracts offshore are leased and all resources are developed over the life of the proposal (total resource development), water supply will be moderately affected. Field development of oil and gas resources will result in population increase of approximately 29,400 new residents, 176 exploratory wells and 845 development and production wells.

Water requirements for new proposal-related residents in the region are estimated at about 5,865 AFY (1.9 billion gallons). Exploratory wells will need about 643 AFY (209.4 million gallons) of water, while production wells will require about 2,515 AFY (819.6 million gallons). State Tidelands development is expected to increase in the Santa Maria Basin, thus augmenting water needs in Central California.

The expected cumulative impacts on water supply are high. The extent of impacts on water supply from State Tidelands development and non-OCS-related activities cannot be determined. However, based on current consumption level it is estimated that the proposal is an insignificant contribution to the overall cumulative impacts on water supply whether cumulative impacts include development of all resources offshore Central and Northern California (total resource development), or only resources described for the alternative, currently leased lands, and non-OCS related projects and proposals. Ongoing population growth is the major contributor overall.

b) Navigation

(1) Ports and Harbors: Ten major ports/harbors exist in Central and Northern California: Moss Landing, San Francisco (Bay Entrance), San Francisco, Redwood City, Oakland, Richmond, San Pablo Bay and Mare Island Strait, Carquiney Strait, Suisun Bay Channel, and Humboldt Harbor and Bay. These ports provide access to local and regional markets as well as foreign commerce.

For this analysis, it is assumed that 75 percent of the crude oil in the Central and Northern California Federal OCS planning area resulting from This proposal would be tankered, while 25 percent would be transported via subsea pipeline.

Impacts on ports/harbors from the implementation of Alternative I-1 could occur as a result of oil spills and increased shipping activity. Over the extent of the proposal, 2.0 oil spills greater than 1,000 bbl and 1.0 oil spill greater than 10,000 bbl are expected to occur following scheduled Central and Northern California lease sales. In the event that an oil spill threatened a port/harbor, deployment of containment booms or other oil spill equipment could delay vessels from entering or departing the port/harbor. The impact is considered to be a short-term, low-level impact on ports and harbors. The probability of this impact is expected to be low.

Increased shipping activity is expected to result from the proposed lease sales. The increased use of tankers and barges to transport OCS crude into or out of the ports and harbors, and the increased use of crew and supply boats would have an associated number of space-use conflicts within the ports and harbors. Vessels require a number of support facilities and berthing space. Increased user charges and/or expansion of port facilities would be likely to result. Displacement of some commercial fishing vessel berth space and support facilities is expected to occur as competition for this space is already keen in Central and Northern California ports and harbors. Substitutions (other locations) are not readily available and opportunities for expansion are limited. See also Section V.D.8.a.2)b)(2), Commercial Fisheries. Moderate to high level impacts of this type could occur on the ports and harbors. The probability of these impacts is considered to be high.

For a discussion of impacts on ports and harbors as a result of increased employment, refer to Section V.D.8.a.2)g)(1).

<u>Conclusions</u>. As a result of the proposal, moderate to high impacts to ports and harbors are expected primarily due to competition for vessel berth space and support facilities on both a local and regional basis.

<u>Cumulative Impacts</u>. In the unlikely event that all areas of the Central and Northern California Federal OCS planning area are leased and all resources are subsequently developed over the extent of the proposal (total resource development), the expected numbers of oil spills are 3.6 spills greater than 1,000 bbl and 1.9 spills greater than 10,000 bbl. In addition to this, 10.5 oil spills greater than 1,000 bbl and 6.3 oil spills greater than 10,000 bbl are expected to result from import crude tankering to the region. An unknown number of spills is expected to occur from development of additional platforms, artificial islands, and/or subsea completion systems in State Tidelands. The cumulative effect of these oil spills and activities could result in low level impacts on ports and harbors. The probability of these impacts is considered to be moderate.

The cumulative effect of increased shipping activity would result in high impacts in ports and harbors. The probability of these impacts is high. Expansion and improvements to existing ports/harbors could occur in the future. These actions could help to mitigate the above impacts. Overall, the expected cumulative impacts on ports and harbors are high.

The proposal contributes less than 56 percent of the platforms and less than 51 percent of the exploratory wells. Since shipping activity associated with the above exploration and development functions is an important impact agent on ports and harbors in Central and Northern California, the proposal provides a substantial component of the cumulative impacts on this resource category whether cumulative impacts include development of all resources offshore Central and Northern California (total resource development), or only resources described for the alternative, currently leased lands, and non-OCS related projects and proposals.

(2) Marine Traffic: Total freight traffic for the ten main ports located between Point Conception and the Oregon/California border was 28,359 vessel arrivals (excluding domestic fishing craft, military ships, pleasure boats and through traffic) for calendar year 1977 (U.S. Army Corps of Engineers, 1977). Recently, 265 petroleum tankers per year serviced Estero Bay (175) and Port San Luis (90) (USDI, 1980c).

Vessel traffic in Central and Northern California is routed through a system of Traffic Separation Schemes and Port Access Routes that are established by the U.S. Coast Guard. (For a definition of these terms and terms that follow, refer to Section V.D.7.a.1)b)(2) above and USDI, 1980c, 1981a).

The Twelfth Coast Guard District has proposed the following recommendations for Central and Northern California commercial and military vessel traffic. A proposed rulemaking notice will be forthcoming in early 1982. 1) A Precautionary Area would exist off San Francisco Bay with a Traffic Separation Scheme (TSS) for Northern, Western, and Southern approaches. The TSS would extend south from the southern approach of this Precautionary Area to 37°N. 2) A safety fairway would extend south from 37°N to 35°N. 3) A TSS would extend south from 35°N to the Precautionary Area off Point Conception. This Precautionary Area will have a 4-mile radius. Vessel usage of the above routing measures will not be mandatory. However, their use ensures an obstruction-free route and most ship masters use them.

Increased marine traffic (e.g., tankering, crew boats, seismic boats) and offshore infrastructure (90 exploratory wells, 465 development/production wells, and 19 platforms) is expected to occur in Central and Northern California as a result of the adoption of the proposed schedule. Potential conflicts could arise during the exploration, development and production phases when these vessels use traffic lanes which cross the proposed leasing area. Maritime military operations occur throughout much of the proposed leasing area. In the event that hydrocarbon-related shipping activities occur in military warning areas, conflicts could occur (see Section V.D.8. a.1)c)(2). Additional conflicts arise when vessels do not adhere to the designated traffic lanes. These activities could result in an increase in commerce and vessel accidents. Accidents could result in a loss of human lives, personal injuries, property damages, and oil spills. Low impacts from proposal-related activity may occur to marine vessel traffic. The likelihood of these impacts is moderate. During peak periods of exploration and development (1986-1989), the likelihood of these impacts would be high.

In the event that the proposed Port Access Route recommendations are not adopted, then current U.S. Coast Guard (USCG) policy concerning hydrocarbon activities in shipping areas would continue to be upheld. Impacts to marine traffic and ports under current USCG policy would be the same as the impacts

that are described above. It is current USCG policy not to permit temporary or permanent hydrocarbon-related structures within vessel traffic lanes or precautionary areas.

Increased imployment in the local shipping industry would result following the adoption of Alternative I-1. This impact is discussed in Section V.D.8.a.2)g)(1).

Development of offshore platforms following the proposed lease sales could provide a benefit to navigation through lighting, distinct markings and colors, fog horns, radar, and other navigational aids.

Conclusions. Low level impacts to marine traffic could occur as a result of increased shipping activity (e.g., tankering, crew boats, seismic boats) and offshore infrastructure. The probability of these impacts would be high during peak periods of exploration and development and moderate in other periods. Overall, the expected impacts on marine traffic are low.

Cumulative Impacts. In the unlikely event that all tracts in the Federal OCS planning area are leased and developed over the life of the proposal (total resource development), it is predicted that 176 exploratory wells, 845 development/production wells, and 34 platforms will result. An unknown number of additional platforms, artificial islands, and/or subsea completion systems may occur as a result of hydrocarbon development in the State Tidelands. The cumulative effect of these increased hydrocarbon development activities (including increased shipping activity) could result in moderate impacts on marine traffic. The likelihood of these impacts is high. Overall, the expected cumulative impacts on marine traffic are moderate.

The proposal contributes less than 56 percent of the platforms and less than 51 percent of the exploratory wells. Since exploration, development and production activity is a significant impact producing agent on marine traffic, the proposal provides a substantial contribution to cumulative impacts on this resource category whether cumulative impacts include development of all resources offshore Central and Northern California (total resource development), or only resources described for the alternative, already leased lands, and non-OCS related projects and proposals.

c) Other Uses of the OCS

(1) Ocean Dumping: Ocean dumping has been, and still remains an accepted means of disposal of waste material from the Coastal States. Off the coast of Central and Northern California, there are 43 designated historic and active dump sites. The materials dumped at each of these sites depends upon the type of permit which was issued for that site by the Environmental Protection Agency. These materials range from dredge spoils to low level radioactive waste and from obsolete munitions to entire ships.

In Central and Northern California waters, there are 12 active dredge spoil sites. Seven of these sites are in State waters with one at Crescent City, one off Humboldt Bay, one off Fort Bragg, three in San Francisco Bay, and one off Moss Landing. The five sites on the Federal OCS are: one at the San Francisco Bar, one off the Farallon Islands, one off Fort Bragg, one off Humboldt Bay and one off Crescent City. There are five radioactive dump sites off Central and Northern California, all on the Federal OCS one of

these is 56 nautical miles west of Point Arguello in 2,000 fathoms, one is more than 250 miles off Cape Mendocino, and three are situated southwest of the Farallon Islands in 500, 850, and 1,200 fathoms of water. These sites are large in area with the Farallon Island sites covering a total area in excess of 200 square miles. Of the 43 sites off Central and Northern California, 16 are with 3 nm of land with the remaining 27 sites on the Federal OCS.

Dump sites are subject to impact from offshore development only if they are directly contacted. The impacts in Central and Northern California would be similar to those in Southern California (Section IV.D.7.a.1)c)(1)). The likelihood of contact, and, therefore of probability of impact from the expected 19 platforms resulting from this schedule is extremely low as most sites have known locations and can, thus, be avoided. Nondesignated or unknown sites are few enough in number to create an extremely low probability of being affected by a structure. The shallower sites have a greater possibility of being affected than the deeper sites and, thus, an impact on one of the radioactive dump sites is considered to be almost nil since all known sites are in deepwater, outside the most favorable geologic areas. If a site is impacted, the impact could range from very high to very low depending upon the material in the dump site, but would be restricted to the immediate local area. Overall the regional impacts on dump sites are expected to be very low, since development resulting from the proposal will tend to stay clear of known dump sites, and the possibility of coming in direct contact with one of the undesignated sites is very slight.

Conclusions. Due to past and present ocean dumping activities, potential for disturbance of toxic and other waste material exists on the OCS. However, since it is unlikely that any dump sites will be contacted, the overall expected regional and localized impacts are very low.

Cumulative Impacts. The cumulative impact from total development of hydrocarbon resources on the Federal OCS and all other projects will only slightly increase over that described above. It is anticipated that 34 platforms will be situated on the Federal OCS in the unlikely event of full development of the resources (total resource development). In addition, development is expected to occur in State waters. There will be almost no impact on dumping at the sites presently being used and those to be used in the future. Careful designation and mapping of existing and future sites by EPA will ensure avoidance by structure placement on the Federal OCS and in State Tidelands. The proposal contributes less than 56 percent of the platforms expected for the region. Since platforms, pipelines and subsea completions are the most significant impact producing agents on dump sites, the proposal substantially contributes to the cumulative impacts on this resource category whether cumulative impacts include development of all resources offshore Central and Northern California (total resource development), or only resources described for the alternative, currently leased lands and non-OCS related projects and proposals. Overall, the expected regional and local impacts are very low.

(2) Military Uses: Approximately 55 percent of the Central and Northern California OCS is currently being used by various military operations (U.S. Dept. of the Interior, 1980a). The military groups involved include the Navy at Moffett Field and the Air Force at Vandenberg AFB (Abbott, 1981). The activities include flight training, missile firing and testing, submarine diving and transit lanes, and anti-

submarine warfare. Much of these activities are conducted on a daily basis and are considered vital to overall national security. The nature of much of these military activities is incompatible with any permanent or semi-permanent OCS installations.

The factor of greatest potential impact to military operations is space-use conflict. Military exercises require large areas of space, both above and below the surface, with large safety zones. Although lease sales and subsequent exploration and development of the OCS by the oil industry are expected to take place in concentrated areas of interest close to the coast, leasing of the entire Central and Northern California OCS opens up the possibility of scattered exploration and development. This possibility would necessitate even more extensive negotiations and coordination than have taken place in the past. Prior to previous Pacific OCS lease sales, the DOD and the DOI have negotiated areas of usage conflicts. Consequently, tracts have either been eliminated from leasing consideration or have had the standard military stipulations invoked, adequately mitigating any impacts.

For most of the Central and Northern California coast, military operations begin at least 6-15 miles offshore, leaving a fairly wide margin of non-military activity near the coast, where the oil industry would be active. Industry has, however, identified the area near Point Conception as one of very high hydrocarbon resource potential. This area, beginning at the coastline, is currently very actively used by the military at nearby Vandenberg AFB. The high interest in this area by both parties is likely to create conflicts, resulting in potentially high impacts to current military activities and increasing the risk of a major accident. These impacts would be adequately mitigated, however, with the invocation of the standard military stipulations. These stipulations are discussed below.

The level of impact on military operations in low resource areas is low, with the entire Central and Northern California coast being offered for lease. Although the level of interest by the oil industry is high in certain areas, with development expected to add 19 platforms most of this activity is expected to take place in concentrated areas. In these areas, high impacts are expected. The likelihood of impact is high due to the overlap of military operations at Vandenberg AFB with areas of high resource potential near Pt. Conception.

At present, the operating orders and regulations (see Sections I.B.4 and 5) designed to reduce impacts do not mandate coordination between the military and the oil industry. As a result, stipulations have been written for Pacific area sales after consultation with the military and used to complement the regulations, further reducing impacts and ensuring safety. The Military Stipulations (Nos. 1 and 2) relate to electromagnetic interference, she lter/evacuation, and holding harmless (liability). These stipulations are invoked on specific tracts in conflict, after DOD and DOI negotiations have removed other tracts in conflict from any leasing consideration. These stipulations are believed to adequately mitigate any impacts resulting from conflicts between the military and the oil industry. They have been successfully enacted in the past. Serious problems would result if they weren't effected.

Conclusions. Low overall regional impacts between the military and the oil industry are expected to occur as a result of the proposal. Locally, high impacts are expected in the Point Conception area where the military is very active through Vandenberg AFB and the oil industry has high resource and development expectations.

Cumulative Impacts. Low impact levels can be expected to other projects such as the Space Shuttle and the MX missile program. Low impacts can be expected to military operations away from high resource potential areas, as the total development of Federal OCS resources in the area predicts 34 platforms and 176 exploration wells, with the accompanying level of support vessels and activity. This alternative will contribute less than 56 percent (19 platforms) of the entire number of platforms predicted in the planning area, in both State and Federal waters. Considering the size of the planning area (50 million acres), this is a relatively low level of development. However, since installation of platforms and location of drilling vessels are the most significant impact producing agents to military activities, this proposal will substantially contribute to the cumulative impacts on military operations whether cumulative impacts include development of all resources offshore Central and Northern California (total resource development), or only resources described for the alternative, currrently leased lands and non-OCS related projects and proposals. Most of this activity is expected to be in areas identified by industry as having high resource potential, in relatively close proximity to the coast. The area of highest industry interest is near Point Conception, where high impacts to military operations are expected. These impacts would be reduced to low if the standard military stipulations are invoked.

(3) Offshore Oil and Gas Infrastructure: Presently, no permanent infrastructure exists offshore Central and Northern California. Therefore, no impacts of the nature described in Section V.D.7.a.1)c)(3) on permanent infrastructure in the planning area will occur.

d) Land Use: This section describes impacts on land use associated only with development of oil and gas infrastructure. Population-related land use issues are included in V.D.8.a.2)g).

Impacts to land use are a result of demand for land onshore to supply the requirements of OCS development. Infrastructure required to develop the resources for this alternative include support bases, pipelines, harbor facilities for supply and crew boats, and airports for helicopters. A large portion of the resources are expected to be found in the Santa Maria Basin, where extensive onshore development already exists.

Temporary operational support bases could be built near significant hydrocarbon discoveries. The temporary support bases would each require between 5 and 10 acres of flat land for development. The most likely locations for support bases would be between the Eel and Mad Rivers, the Manchester Project Site near Point Arena, Bodega Bay, and Half Moon Bay.

Crew and supply boats could use the existing piers at Humboldt Harbor, San Francisco Harbor, Morro Bay Harbor and Port San Luis. Crew boats are expected to have an insignificant impact of existing harbor operations. Supply boats could cause significant disruption in existing harbor operations and require an additional 50-75 acres of flat coastal land per supply terminal for storage of materials and equipment.

Approximately 1,300 acres could be committed to the construction of 200 miles of onshore pipeline required to accommodate the expected resources in Central and Northern California. Pipelines are expected to come ashore in the vicinity of the Eel River, Point Arena, and Half Moon Bay. Pipeline landfalls require right-of-way between 50 and 160 feet, additional land between 40 and 60 acres are required if a pumping station or tanker or barge terminal is required.

The required speed of development to meet the goals of this alternative may require the development of additional platform fabrication facilities (see Section V.D.7.a.1)d)(1)).

To develop the resources for this alternative, the development of infrastructure is likely to occur. Significant impacts will occur at the sites of permanent supply bases. In addition, if 1,300 acres are to be devoted to pipelines, some local land use changes are likely to result from this alternative. On a local basis, OCS related infrastructure development could require conversion of a small amount of recreational, agricultural and commercial lands to industrial use. Conversion of other land uses to industrial use may be difficult because of zoning constraints in Local Coastal Plans. Insignificant alterations to land use are likely to result at those locations that only service crew boats.

<u>Conclusions</u>. Development of this alternative will result in significant impacts on harbors that choose to service supply boats. Locally, land use will undergo significant impacts as a result of infrastructure development. Regional changes in land use are expected to be very low. Overall, the impacts from this alternative are very low.

<u>Cumulative Impacts</u>. In the unlikely event that all tracts offshore are leased and all resources developed over the life of the proposal (total resource development), cumulative impacts from total development of resources on the Federal OCS, expansion of Port San Luis, State Tidelands development, and the proposed Sacramento Coal Terminal are expected to result in moderate changes in land use. The additional stress on available coastal land could result in the removal of recreational boating opportunities as well as shift from commercial fishing to crew a supply boat operation. Since non-OCS-related activities contribute the heaviest to the impacts on land use, the contribution of this proposal is low whether cumulative impacts include development of all resources offshore Central and Northern California (total resource development), or only resources described for the alternative, currently leased lands, and non-OCS related projects and proposals.

e) Cultural Resources

(1) Offshore Cultural Resources: The cultural resources subject to impact offshore include prehistoric and historic sites of varying significance. Little work has been done offshore in Northern and Central California in regard to prehistoric sites. There are no recorded submerged sites, but numerous coastal eroding sites and coastal shell mounds are known. A maritime adaptation similar to the Channel Islands area is not known in Central or Northern California, but the use of intertidal marine resources is well documented. The existence of submerged prehistoric sites is suspected but high wave energies during transgression/ regression episodes may have destroyed most sites. Only sites in low energy areas such as

lagoons, estuaries and low energy beaches are likely to have survived. The difficulty exists in interpreting the geologic record of low energy areas back through the last 40,000 to 150,000 years.

Of the over 1,500 recorded shipwrecks offshore California, over two-thirds are recorded in Central and Northern California. This high number of wrecks is a function of the coastal terrain, currents, and the higher incidence of inclement weather than occurs south of Point Conception. An extensive coastal freightering economy was developed to exploit the wood resources of the Northern coast and to supply building material for San Francisco and points further south. Ships from this industry may account for a large number of the recorded shipwrecks. The majority of shipwrecks are located in State waters, but this does not reduce the possibility of shipwrecks in Federal waters. Vessel drift after abandonment, navigational errors, and reporting errors are factors that affect the actual location of a shipwreck. Thus, ships reported lost in State waters may actually be in Federal waters.

The impacting agents to submerged cultural resources are bottom-disturbing activities, human activities, and the creation of magnetic anomalies. Bottom-disturbing activities can include any activity utilizing anchors for stabilization; pipeline laying activities such as trenching, use of lay or pull barges; well drilling activities either during the exploration phase (90 wells proposed) or during the development and production phase (465 wells expected); and platform construction and anchoring (19 platforms expected). Human activities are restricted to the use of divers for construction, inspection and maintenance, and equipment recovery. Divers may locate a submerged cultural resource and either remove artifacts or inform others of the location and thus encourage illegal collection. The placement of metal objects on the ocean floor (for example, pipelines, subsea completions, or lost equipment) may mask the signature of historic resources during a magnetometer survey. Failure to identify the resource during the survey phase may lead to its inadvertent destruction during construction or exploration. A more detailed discussion is presented in Section V.D.7.a.1)e)(1).

The likelihood of disturbing cultural resources is influenced by several factors. The probability of impacts to submerged cultural resources is directly related to the number of bottom-disturbing activities that occur during the course of development, that is, the number of wells (555), the number of platforms (19), the number of subsea completions, the number of pipelines, and the number of other bottom-disturbing activities (all unknown). Submerged prehistoric sites, if they exist, would be limited to water depths of less than 150 m or at the approximate sea level of the lowest sea level regression in the last 50,000 years. As mentioned above, wave energy has influenced the probability of the existence of prehistoric sites. The 150 m bathymetric line extends much further into Federal waters in Central and Northern California than in Southern California. Opposite the San Francisco Bay, it extends out to the Farallon Islands nearly 27 miles. Therefore, historic resources are most likely within 3 miles of the coast or within State-controlled waters. However, as discussed above, the possibility of shipwrecks in Federal waters does exist, particularly

opposite harbors, sheltered areas, prominent land points, rocky outcrops, reefs, or near historic shipping routes. The likelihood of impact to any cultural resource from OCS developments is not as great as in Southern California because of the lesser number of proposed activities, while there may be a higher likelihood of impact to historic resources because of their more frequent occurrence. Impact likelihood to prehistoric resources is very hard to gage because of the lack of investigation for submerged prehistoric resources undertaken in Northern and Central California. Overall, considering the known resource base, the number of proposed activities, and the size of the planning area, a low of regional impacts to cultural resources in Central and Northern California from OCS development are expected. If cultural resources are destroyed, the loss would be irreversible and irretrievable.

The discussion above assumed that existing rules and regulations designed to reduce impacts are part of the proposal. (Refer to Sections I.B.4 and 5 for a discussion of the rules and regulations.) In the past, the Pacific region has also utilized seven additional stipulations. If the Cultural Resource Stipulation is utilized, a reduction in the impacts from OCS development to cultural resources is expected. The stipulation requires remote sensing surveys be undertaken on those tracts with a potential for containing a cultural resource site. The survey is a sampling survey and does not guarantee the nonexistence of cultural resources should none be recorded. The selection of tracts for survey is based on the best available data. Because of limitations in the ability to detect cultural resources, there is still expected to be some loss to the resource.

Conclusions. Overall, considering the known resource base, the number of proposed activities, and the size of the planning area, regional impacts to offshore cultural resources are expected to be low.

Cumulative Impacts. In addition to the impacts discussed above, impacts to cultural resources from other projects may be expected if they disturb the sea floor. Of concern here are the expansion of any ports or harbors, sewage outfalls, State Tidelands development, and ocean dumping. All of these activities can increase the impacts to submerged cultural resources in ways similar to those identified above. Bottom dragging activities to recover rocket hardware from Vandenberg launches could significantly impact submerged cultural resources depending upon the location. In normal launch operation, this is not expected to be an impact consideration, but should an accident or malfunction occur, especially with the space shuttle launches, near shore dragging could occur in waters $\leq$150 m.

Thirty-four platforms, 1,021 exploration development and production wells, and an unknown number of other potentially bottom-disturbing activities are projected in Central and Northern California planning area in the unlikely event that all resources are leased and developed (total resource development). An unknown number of platforms, artificial islands, subsea completions and pipelines may occur as a result of State Tidelands development. The Santa Maria Basin is currently the most likely place for State development. If the Cultural Resource Protective Stipulation is used, the cumulative impact may be reduced. There will be low to moderate overall cumulative impact to cultural resources in Central and Northern California from OCS and other development.

This proposal contributes over 50 percent of the cumulative bottom disturbing activities expected from OCS development. Even with a low to moderate expected impact level regionwide, this proposal contributes a significant amount to the cumulative impact level whether cumulative impacts include development of all resources offshore Central and Northern California (total resource development), or only resources described for the alternative, currently leased lands and non-OCS related projects and proposals.

(2) Onshore Cultural Resources: Prehistoric and historic sites can provide information regarding the past lifeways of the peoples of California: Native Americans, Spanish, Anglo, Asian, and others. These sites can provide information now and, if protected and preserved, they can provide information in the future when new recovery techniques are available and with new investigative orientations.

There are numerous sites, historic and prehistoric, along the coast that have National, State or local significance and are listed in the National Register of Historic Places. These sites are protected by the provisions of the National Historic Preservation Act, as amended, and other protective legislation and regulations. Significant sites not yet listed on the National Register also are protected by Executive Order 11953.

With the increased awareness of their cultural and spiritual past recognized by the Native American Religious Freedom Act, the Native Americans of California have an increased desire to collect for ceremonial purposes marine species that live in intertidal areas. In addition, there is an unknown number of Native Americans using the intertidal areas for subsistence gathering.

Visual impacts to National Historic Register sites may be caused by the introduction of intrusive or incongruent influences to the historic nature of the property. The visual intrusion of OCS development and exploration may impact the ceremonial and religious practices of Native American and other ethnic groups.

All surface-disturbing actions have the potential to destroy or disturb terrestrial prehistoric and historic sites. Activities with this potential include, but are not limited to, pipelaying activities, construction or expansion of support and processing facilities, construction of temporary facilities for short-term projects, and oil spill cleanup. A total of 19 platforms are expected for Northern and Central California associated with the adoption of the proposed schedule. Most platforms will have at least one pipeline either for service needs (electricity, water) or for production purposes (gas, oil). Since State and local jurisdictions have primary authority over onshore development, it is assumed that their requirements for cultural resource protection will significantly reduce the likelihood of sites being disturbed or destroyed. There is always the possibility of undetected sites being destroyed during the construction process. The likelihood of impact to cultural resources is low.

With a prediction of 1.9 spills greater than 1,000 bbl and 1.0 spill of greater than 10,000 bbl of oil, there is a low probability that there will be oil spill-related impacts to cultural resources and to subsistence or ceremonial gathering. The cleanup of oil spills that have reached the

shore could cause cultural resource site loss as a crisis atmosphere may preclude identification and avoidance of any site prior to cleanup efforts. If cultural resource site recognition and protective measures are made part of the operating procedures for cleanup efforts, this risk may be reduced. The oil spill itself may seriously impact the intertidal area (refer also to V.D.8.a.2)a), Coastal Ecosystems) and impact the subsistence and ceremonial gathering of Native Americans and other ethnic groups. The likelihood of an oil spill occurring in areas of religious or ceremonial significance is increased if development is concentrated in the area around Point Conception. For families that rely on this gathering in providing basic food supplies, this impact could be catastrophic. Regionally, the likelihood of oil spill related impacts is low.

Native Americans have stated that the visual presence of offshore development interferes with ceremonial and spiritual activities. Of concern is the Point Conception area, considered by them to be the western gateway to the spirit world. Also significant is the area offshore from the Mendocino Chinese Temple, a National Register nominated site. The presence of platforms, according to temple members, may obstruct spiritual passage of the dead to China. There are 19 platforms proposed for development in Central and Northern California. Should development concentrate in the Santa Maria Basin in the Point Conception area or off Mendocino, the potential for visual intrusion increases. Other significant ceremonial sites are known to exist, but locational data is limited. In urban areas visual impact to National Register listed sites is expected to be low. In less developed areas, the impact may be significant and could impact the property in terms of its National Register criteria.

The likelihood of visual impacts to ceremonial or religious sites, or to National Register listed sites is low. Existing rules and regulations designated to reduce impacts are assumed in the above analysis. It is assumed that State and local governments that have jurisdiction will require protective measures for protection of onshore cultural resource sites.

Regionally, the overall impact to terrestrial cultural resources is expected to be low, based upon the low level of proposed development, existence of some infrastructure and the large size of the planning area.

Conclusions: Overall, considering the known resource base, the number of proposed activities, and the size of the planning area, regional impacts to onshore cultural resources are expected to be low.

Cumulative Impacts. The onshore cultural resource base is constantly being reduced by development projects. Combining the potential for onshore OCS-related development with the development already occurring or proposed for the coastal area places a continuing threat to an already heavily impacted resource. State and local laws and regulations are expected to require mitigation of impacts to cultural resources from onshore development. Federal regulations require mitigation of impacts to cultural resources caused by Federal projects. A cumulative total of 34 platforms and a similar number of pipelines is expected for the development of all Federal OCS oil and gas resources in Central and Northern California. The impacts of visual intrusion from development of existing leases and future leases will be most significant in the Point Conception area and off Mendocino

because of the areas' significance to various ethnic groups. Other areas of visual impact may become identified as development occurs and intrudes upon the use of an area. In the unlikely event all hydrocarbon resources in the planning area are leased and developed over the life of the proposal (total resource development), 3.6 spills greater than 1,000 bbl and 1.9 spills greater than 10,000 bbl are predicted from OCS development. An additional 10.5 spills greater than 1,000 bbl and 6.3 spills greater than 10,000 bbl are expected from import crude tankering during this 30-year period. These predicted spills indicate a high probability of oil spill-related impacts occurring during the life of the project. State Tidelands development is expected to occur over the life of the project but at an unknown rate. Any associated onshore development will increase the potential for impact to cultural resources. The cumulative impact to cultural resources, given the size of the area and the level of all known development, is expected to be moderate. The proposal contributes less than 14 percent of the predicted spills over 1,000 bbl and less than 12 percent of the cumulative predicted spills over 10,000 bbl, while over 50 percent of the cumulative total of new platforms and associated pipelines will result from the proposal. Since non-OCS-related development has the greatest impact on terrestrial cultural resources, the contribution of the proposal to cumulative impacts is low whether cumulative impacts include development of all resources offshore Central and Northern California (total resource development), or only resources described for the alternative, currently leased lands and non-OCS related projects and proposals.

2) Impacts of Special Concern

a) Coastal Ecosystems

(1) Intertidal: Intertidal shorelines consist of rocky, boulder, and sandy beaches. The intertidal shorelines of Central and Northern California are made up of approximately 50 percent sandy beach and 50 percent rocky shore. In Central and Northern California, the intertidal zones are exposed to much greater wave energy than in Southern California; however, a number of sheltered shorelines also are present.

The rocky and boulder intertidal beaches of Central and Northern California support a very diverse and abundant assemblage of invertebrates, seaweeds, and marine plants. Populations of sandy beach organisms are sparse in comparison with rocky shore populations. Most of the intertidal shorelines of Central and Northern California receive relatively little human usage. As a result of this low level of human activity, many of the intertidal habitats support undisturbed, natural communities.

Oil spills and the installation of subsea pipelines will impact intertidal shorelines following the implementation of Alternative I-1. A discussion of the effects of these impacting agents on intertidal organisms is given in Section V.D.7.a.2)a)(1).

Over the duration of the proposal, 2.0 oil spills greater than 1,000 bbl and 1.0 oil spill greater than 10,000 bbl are expected to occur following Central and Northern California lease sales. Low to moderate ecological loss is expected on rocky intertidal shorelines as a result of these spills. The likelihood of the impact is moderate. An exception to this is

on steep rocky shorelines that are exposed to high wave energy. Here, the impacts could be reduced slightly, since oil would probably have a very short retention time.

Sandy beach communities have suffered lower oil-related impacts on open coastlines when compared to rocky shores. However, there is a greater potential for oil to remain entrapped in the sediment of sandy beaches. The high wave energy of Central and Northern California would generally remove oil from the beach sediment within a relatively short period. For this reason, the impacts from an oil spill on sandy beaches would be low. The probability of these impacts is moderate. An exception would be in areas that support populations of clams, such as Pismo Beach. At the very least, an oil spill would preclude clamming for as long as oil remained in the area. Endemic species in the Nipomo Dunes area would not be harmed directly by an oil spill, but could be damaged during cleanup operations. Depending on the methods employed during cleanup operations, damage to other intertidal areas, both rocky and sandy, could be expected.

Impacts from the installation of subsea pipelines should be low level on both rocky and sandy intertidal beaches. The likelihood of these impacts is high.

Overall the expected regional impacts on intertidal communities are low to moderate due to the relatively few spills predicted for the region.

Conclusions. Rocky intertidal shores are expected to sustain low to moderate ecological losses, and sandy beaches are expected to sustain low ecological losses. Overall, the expected regional impacts on intertidal communities are low to moderate.

Cumulative Impacts. In the unlikely event that all tracts offshore Central and Northern California are leased and developed during the life of the proposal (total resource development), the expected number of oil spills is 3.6 oil spills greater than 1,000 bbl and 1.9 oil spills greater than 10,000 bbl. Additionally, 14.1 oil spills greater than 1,000 bbl and 6.3 oil spills greater than 10,000 bbl are expected to result from import crude tankering to the region during the life of the proposal. An unknown number of spills are expected to occur from development of additional platforms, artificial islands, and/or subsea completion systems in State Tidelands. The cumulative impact of these oil spills on rocky intertidal areas will be moderate ecological loss. The probability of this impact is high. The most likely impact on sandy beaches will be low. The likelihood of this impact is high.

Intertidal habitats are also affected by other forms of disturbance, such as trampling by humans, discharges of domestic and industrial waste. Over the life of the proposal (30 years), these disturbances, combined with those from oil and gas development, would result in increased ecological losses.

The proposal contributes less than 14 percent of the oil spills greater than 1,000 bbl, less than 12 percent of the spills greater than 10,000 bbl

of the cumulative case and therefore contributes a minor portion of the cumulative impacts whether cumulative impacts include development of all resources offshore Central and Northern California (total resource development), or only resources described for the alternative, currently leased lands and non-OCS related projects and proposals.

Overall, the expected regional impacts on intertidal communities is moderate.

(2) Subtidal Benthos: The continental shelf of Central and Northern California is gradually sloping to the continental slope. Although it is periodically cut by canyons or interrupted by biologically important shallow banks or sea mounds, the shelf along Central and Northern California is a typical continental shelf in contrast to the atypical Southern California continental shelf. The sediment of the Central and Northern California shelf generally grades from coarser sandy sediment in shallow water near shore to finer silt and clay substrates in the deeper waters near the outer margin. The benthic invertebrates similarly grade from filter or suspension feeders on sandy substrates to deposit feeders in finer sediments. Although little information is available on the bottom communities of the region, it is reasonable to assume that they are productive and diverse owing to the indirect evidence of abundant upwelling and high fisheries landings. The presence of endemic species is not well known, but is assumed to be less than in Southern California. Central California has important kelp forests which gradually decrease in Northern California.

The impact agents associated with OCS hydrocarbon development on the subtidal benthos are platforms and associated drilling cuttings and mud, oil spills, and pipelines. A discussion of the effects of these agents is contained in Section V.D.7.2)a)(3). The types and magnitude of impacts for Central and Northern California should be essentially the same as predicted therein. The shallow bank or reef areas that may be sensitive to oil development impacts include St. George's Reef, Blunt's Reef, Tolo Bank, Cordell Bank, Fanny Shoals, Pioneer Seamount, and Santa Lucia Bank.

Over the life of the proposal, 19 platforms, 2.0 spills greater than 1,000 bbl, and 1.02 spills greater than 10,000 bbl are expected to result from the development of hydrocarbons in the Central and Northern California planning area. The likelihood of impacts will be slightly less than expected for Southern California, although none of the categories (e.g., low, moderate, high) can be realistically lowered. As development occurs along with associated spills, impacts will occur as predicted for Southern California. The likelihood of multiple spills impacting the same benthic area will be low.

As a result of all proposed activities discussed above, hard bottom communities are likely to sustain moderate to high ecological losses in the immediate vicinity of platforms, and moderate ecological losses near pipelines. Soft bottom communities are likely to sustain moderate ecological losses near platforms. In other areas, hard and soft bottom communities are expected to sustain low or no ecological losses. However, although unlikely, some hard bottom reefs could sustain high ecological losses if

platforms are concentrated on a reef, or if a large amount of oil from one or more oil spills reaches bottom. Also, although unlikely, several endemics from soft and hard bottom communities could suffer very high ecological losses from oil spills. Overall, the expected regional impacts on subtidal benthos are low to moderate since impacts are likely to be restricted to the localized areas discussed above.

Conclusions. As a result of the proposal, hard bottom communities are likely to sustain moderate to high ecological losses in the immediate vicinity of platforms, and moderate ecological losses near pipelines. Soft bottom communities are likely to sustain moderate ecological losses near platforms. In other areas, hard and soft bottom communities are expected to sustain low or no ecological losses. Overall, the expected regional impacts on subtidal benthos are low to moderate.

Cumulative Impacts. Cumulative impacts to the benthos in Central and Northern California will generally be similar to the types of impacts discussed for Southern California (Section V.D.7.a.2)a)(2)).

Thirty-four platforms are predicted for the area in the unlikely event that all resources in the planning area are leased and developed (total resource developement). An unknown number of additional platforms may occur as a result of resource development in the State Tidelands. Critical hard bottom reefs or banks, noted above, remain sensitive to concentrated platforms and associated drilling muds and cuttings. Impacts under these conditions are expected to be high to the entire reef or hard bottom area. The likelihood of such impacts is moderate. Areas which do not have concentrated platforms will experience low impacts except in the immediate vicinity of the platform.

In the unlikely event that all tracts offshore Central and Northern California are leased and developed during the life of the proposal, the expected number of oil spills is 3.6 greater than 1,000 bbl and 1.9 spills greater than 10,000 bbl. An additional 10.5 oil spills greater than 1,000 bbl and 6.3 spills greater than 10,000 bbl are expected to result from import crude tankering to the region during the same 30-year period. An unknown number of spills are expected to occur from development in State Tidelands. Although the cumulative impact of these oil spills is low, there is a possibility of high impacts on hard bottoms.

The proposal contributes less than 14 percent of the oil spills greater than 1,000 bbl, less than 12 percent of the spills greater than 10,000 bbl, less than 56 percent of the platforms of the cumulative case. Compared to the likelihood of cumulative impacts from oil spills, the contribution from the proposal is relatively minor whether cumulative impacts include development of all resources offshore Central and Northern California (total resource development), or only resources described for the alternative, currently leased lands and non-OCS related projects and proposals. The contribution from platform-related impacts from the proposal, however, is significant.

Overall, the expected cumulative regional impacts on subtidal benthos are moderate to high. The concern for high impacts comes from multiple plat-

forms on more than a single reef or concentrated platforms on a hard bottom area of fairly large areal extent. This added area may cause an alteration of ecological relationships within the region that will last over two years.

(3) Estuaries, Marshes, and Wetlands: Estuaries in Northern and Central California are numerous and contribute significantly to the coastal ecology. Northern California contains several of the larger estuaries as well as many smaller estuaries which are important to wildlife and the ecology of the area. South of San Francisco Bay there are fewer estuaries, but those that are present are important. Over half (28) of the estuaries considered important in Central and Northern California are closed to the sea for various periods during the summer and fall.

Factors of proposal-related development potentially affecting wetlands are oil spills and onshore construction. For a discussion of wetlands or estuaries and the impacts thereon, see Section V.D.7.a.2)a)(3).

The level of impacts to wetlands from spilled oil is high to very high. There are fewer predicted spills in Central and Northern California than for Southern California (2.0 spills greater than 1,000 bbl as opposed to 3.3 spills, and 1.0 spills greater than 10,000 bbl as compared to 1.8 spills); however, wetlands are more plentiful in Central and Northern California in addition to being more difficult to protect (high wave action occurs a greater percent of the time in this planning area). Therefore, the likelihood of an occurrence causing high impacts is moderate. Some onshore development may occur in coastal areas related to population increases. Adverse impacts associated with this is not considered likely due to constraints imposed by coastal zone legislation and plans.

Overall, the expected regional impacts on estuaries and wetlands are low to moderate. Estuaries in Central and Northern California are of such importance to coastal ecology that the elimination of an estuary through a high impact could alter the coastal ecology of a significant portion of the region.

<u>Conclusions</u>. There is a moderate probability that oil will enter an estuary resulting in high to very high impacts.

Overall, the expected regional impacts on estuaries and wetlands are low to moderate.

<u>Cumulative Impacts</u>. In the unlikely event that all tracts offshore Central and Northern California are leased and developed during the life of the proposal (total resource development), the expected number of spills greater than 1,000 bbl is 3.6 and 1.9 spills greater than 10,000 bbl. An additional 10.5 spills greater than 1,000 bbl and 6.3 spills greater than 10,000 bbl is expected from import tankering during the same 30-year period. Development of State Tidelands hydrocarbon resources will add an unknown number of spills to the planning area. If this number of spills were actually to occur, the probability of a spill entering an important wetland during the life of the proposal is high. The expected impact is high to very high.

The proposal contributes less than 14 percent of the oil spills greater than 1,000 bbl and less than 12 percent of the spills greater than 10,000 bbl of the cumulative case. Therefore, the proposal contributes a minor portion to the overall cumulative impacts whether cumulative impacts include development of all resources offshore Central and Northern California (total resource development), or only resources described for the alternative, currently leased lands and non-OCS related projects and proposals.

Overall, the expected cumulative regional impacts on estuaries are moderate. Locally, the expected impacts on estuaries are high to very high.

b) Commercial Fisheries

(1) Fish: The marine environment off Central and Northern California is rich in fish life. Of the 562 species of coastal marine fishes known to occur in California, over 500 are found in Central and Northern California waters. Less than one-sixth of these species are commercially harvested.

Over the life of the proposal, 2.0 oil spills greater than 1,000 bbl and 1.0 oil spills greater than 10,000 bbl are expected to result from Alternative I-1 Central and Northern California sales. Oil spills can impact fish populations by causing short-term acute impacts or long-term sublethal impacts. Since most oil remains at the surface, species which occur in the surface layer are the most vulnerable to impacts from oil. Many species have egg, larval, and juvenile stages which inhabit the surface layer and are susceptible to oil. Also of concern are impacts to adults. If numerous sexually mature animals are killed by oil, both the size and reproductive potential of the population will be directly reduced. Thus, species whose adult stages are concentrated near the surface at the time of a large oil spill (e.g., Pacific herring, northern anchovy) may be significantly impacted. There are too many variables to accurately predict these impacts, particularly in economic terms. However, based on available information (see discussions in Appendix 8 of the FEIS and Section V.D. 8.a.1)a)(1)), surface fish populations are expected to sustain low to moderate ecological losses (see definitions for coastal ecosystems at the beginning of Section V.D.) each time there is a major oil spill. Since the oil spills listed above probably will not occur together, the combined effect of low to moderate ecological losses each time there is a major oil spill probably will result in an overall low to moderate ecological loss to surface fishes over the life of the proposal. Although unlikely, if one major oil spill follows another in the same area before the populations have recovered, surface fish populations probably would sustain moderate ecological losses. Since fish populations fluctuate dramatically under existing conditions, any decrease resulting from the proposed action probably will be difficult to detect.

Oil may also have a significant impact on salmon and other anadromous fishes (see Fry, 1973) that use chemical cues to return to their native streams to spawn. Since oil could interfere with their ability to detect these natural cues, these fish are particularly Vulnerable to oil in the sea when they first enter the sea as young and later when they return to spawn. Field tests have shown (Malins, 1980) that salmon will initially

avoid a contaminated fish ladder but later some will use the ladder despite higher levels of hydrocarbons. Also, salmon have been shown to avoid oil in laboratory experiments (Rice, 1973). Therefore, oil contamination of estuaries and streams probably would prevent some anadromous fish from returning to their native streams to spawn. In the case of a large oil spill reaching an estuary, such contamination could reduce the runs in that estuary for a period of 5 years or more, resulting in high ecological losses. The likelihood of this impact occurring is expected to be low to moderate. However, in the unlikely event that one major oil spill follows another in the same estuary before the populations have recovered, there would be a moderate to high probability that the fish populations that breed in that estuary would sustain high ecological losses.

Many other species use estuaries as spawning or nursery areas. If a large oil spill occurs and oil gets into an estuary and stays for several tidal cycles, there would be high ecological losses to these species as well (see discussion in Section V.D.8.a.2)a)).

Reduction in the population size of one species could affect other species in the food chain. For example, many species feed on northern anchovies. If the number of anchovies is substantially reduced, their predators may need to switch to another food source, if available, to survive. Consumption of this new food source could affect its population size as well. Conversely, reduction in the number of anchovies means the population size of the species it feeds on could increase. The marine food web is extremely complicated and it is not possible to assess how significant the reduction of one species due to the proposal will be to others. However, the fact that population sizes are interrelated needs to be recognized.

Man-made structures could impact fish populations if they disrupt habitat that is essential to the species. Disruption would be most likely during placement of a structure. Of concern are dover and petrale sole since they have fairly discreet spawning areas. However, it is not known if placement of structures in these spawning areas will disrupt the reproductive capabil-iities of these species. Since the essential habitats of most other species are not known, it also is not possible to determine if other species will be impacted.

Several types of discharges and effluents could be released during OCS oil and gas activities. OCS Order No. 7 prohibits disposal of any waste materials into the ocean that will create conditions which will adversely affect aquatic life. Disposal of waste materials is regulated by the Environmental Protection Agency. Of concern are drilling muds because very little is known about their long-term, chronic impacts. There are indications that these muds could produce elevated trace metal concentrations in marine organisms and interfere with reproductive processes (see discussions in Appendix 8 of the FEIS and Section V.D.8.a.1)a)(1). The impact that these elevated trace metal concentrations will have on fish populations is unknown. Any potential impacts from drilling muds to this area could be avoided if drilling muds and cuttings are barged out of the area or ashore.

The proposal also could have beneficial impacts on fish populations. There is no doubt that production platforms and probably other offshore structures act as artificial reefs (Simpson, 1977). The population sizes of some species may actually be slightly increased by the presence of these reefs. Also, adverse impacts to commercial and sportfishing operations (see Sections V.D.8.a.2)b)(2) and f)) could result in less fish being caught allowing fish populations to increase.

The analysis above assumes that only the areas within the planning area with favorable geological characteristics will be developed. If some development occurs outside these favorable areas, oil spills probably still would occur near important fish habitats. Therefore, impacts to fish populations are not expected to be less than those described above. In fact, if development occurs closer to the Klamath River area and a major oil spill occurs in this area, high ecological impacts to salmon are more likely to occur. Also an oil spill in this area is more likely to create impacts to salmon in Oregon and Washington. Impacts to these areas are expected to be low.

As a result of all proposed activities discussed above, surface fish populations are expected to sustain low to moderate ecological losses, and salmon and other anadromous fishes may sustain high ecological losses. Overall, the regional impacts on fish are expected to be low since impacts from the proposal are expected to be restricted to a few species in localized areas and, therefore, most fish species will not be impacted.

Conclusions. As a result of the proposal, surface fishes (e.g., Pacific herring, northern anchovy) are expected to sustain low to moderate ecological losses, and salmon and other anadromous fishes may sustain high ecological losses. Overall, the expected regional impacts on fish are low.

Cumulative Impacts. In the unlikely event that all tracts offshore Central and Northern California are leased and developed during the life of the proposal (total resource development), the expected number of oil spills is 3.6 oil spills greater than 1,000 bbl and 1.9 oil spills greater than 10,000 bbl. An additional 10.5 oil spills greater than 1,000 bbl and 6.3 oil spills greater than 10,000 bbl are expected to result from import tankering of crude oil. An unknown number of oil spills are expected to occur from resource development in State Tidelands. Since more than 14.0 oil spills greater than 1,000 bbl are expected, it is probable that one large oil spill may follow another in the same area. Therefore, the cumulative impact of these oil spills on fish populations probably will cause moderate ecological losses to surface fishes and high ecological losses to salmon and other anadromous fishes.

Many fish populations, particularly those important to commercial and sport fishermen, also are stressed from natural oil seeps, sewage disposal (see discussion in Section V.D.8.a.1)a)), or fishing pressure. These stresses, particularly the harvesting of large numbers of fish, result in high ecological losses to several fish populations. Overall, the expected regional impacts on fish populations due to cumulative impacts is high.

The proposal contributes less than 14 percent of the oil spills greater than 1,000 bbl, and less than 12 percent of the oil spills greater than

10,000 bbl but does not contribute significantly to the other impact agents discussed above. Since the non-OCS-related impacts agents have the greatest impact on fish populations, the contribution of the proposal to cumulative impacts on these populations is low whether cumulative impacts include development of all resources offshore Central and Northern California (total resource development), or only resources described for the alternative, currently leased land and non-OCS related projects and proposals. However, even this small increase in cumulative impacts is significant since fish populations are already very stressed.

(2) Commercial Fisheries: California is an important center for commercial fishing interests. In 1980, over 804 million pounds of fish and shellfish worth $323 million to commercial fishermen were landed in California (U.S. Dept. of Commerce, 1981a). This represents one-seventh of all landings in the United States. About one-fourth of the California landings were into Central and Northern California ports. The total value of the California commercial fishing industry is over $1 billion due to the contributions of the support, processing, transportation, and marketing industries.

Over the life of the proposal, 2.0 oil spills greater than 1,000 bbl and 1.0 oil spills greater than 10,000 bbl are expected to result from Alternative I-1 Central and Northern California sales. If fish or invertebrate populations decrease due to impacts from oil spills or other impact agents (see discussions in Sections V.D.8.a.2)a) and b)(1), the commercial fishing industry could sustain low to moderate economic losses since there would be a loss in potential catch. Most of these potential impacts are expected to be short term in duration, but the $57 million salmon fishing industry may be impacted for 5 years or more.

A large oil spill also could impact commercial fisheries by causing a reduction in fishing space and time. It is unlikely that commercial fishermen will harvest in the area of an oil spill because: 1) their boats and gear may be contaminated, 2) they may be confined to port by oil containment booms, and 3) direct coating and incorporation of petroleum hydrocarbons can cause tainting of marine organisms, rendering them undesirable or unmarketable. A large oil spill in prime fishing grounds probably would cause short-term moderate to high economic impacts by precluding fishing. Although unlikely, if one major oil spill follows another in the same prime fishing grounds, short-term high economic impacts to the commercial fishing industry probably would result.

None of the mariculture industries are anticipated to be impacted since the probability of an oil spill reaching them is very low. However, if a large oil spill reaches mariculture operations, they would be impacted similarly to other commercial fisheries. The organisms would not be marketable due to tainting even if they lived through an oil spill. Equipment coated with oil

would need to be replaced. Additionally, since they have less mobility than other fishermen, mariculture farmers could be forced out of business.

As a result of the proposal, 19 platforms are estimated for the Central and Northern California planning area. Platforms can result in lost fishing space, time, and gear. The fisheries most likely to have significant conflicts with these offshore structures are the commercial trawl fisheries, but purse seining may have some conflicts (see discussion in Centaur Associates, Inc., 1981). In general, a maximum radius of 1,320 feet may be lost around all structures if fishermen choose to observe the payment criteria of the Fishermen's Contingency Fund (see Section I.B.5 of the FEIS). Multiplying the number of platforms (19) predicted for the Central and Northern California planning area times the area that would be lost by a 1,320-foot radius buffer zone (50.8 hectares) and dividing by the total planning area (15.4×10^6 hectares) yields a 0.01 percent loss (1.0×10^3 hectares) in fishing area. Therefore, the total fishing area that will be lost throughout the planning area will be very small. However, if several platforms are placed within prime trawling grounds, the $41 million commercial trawl fishing industry may experience low to moderate economic losses due to preclusion of fishing space.

At the same time, platforms can provide benefits as navigational aids and places to obtain emergency help in case a vessel is disabled or a crewman injured, and platforms could be used for mariculture operations (particularly for growth of mussels and abalones). There is no doubt that production platforms and probably other offshore structures act as artificial reefs (Simpson, 1977). However, this most likely will have a slight impact on most fish populations and may not benefit fishermen since oil companies generally discourage fishermen from anchoring or otherwise floating next to a platform.

Most if not all platforms will have one or more associated pipelines. Until recently, pipelines in Southern California have created very few problems for commercial fishermen. However, commercial trawl fishermen have not been able to fish a 12-square-mile area as a result of pipelaying activity in the Santa Barbara Channel since 1979. Fishermen can no longer trawl this area because their nets hang up on mud mounds and trenches created by anchors from the pipeline lay-barge. Although OCS Order No. 9 requires that pipelines be installed and maintained to be compatible with commercial trawl gear, attempts to restore the area have not been successful. Additionally, it is not clear what needs to be done differently in the future to avoid the problem or whether this problem is likely to occur in Central and Northern California. However, since this area has sediments that are similar to Southern California, the $41 million commercial trawl fishing industry in Central and Northern California may experience moderate to high economic impacts from loss of fishing space and time if pipelines are placed in important fishing areas.

Other subsea structures which potentially can cause significant conflicts are debris and temporarily abandoned subsea wellheads (also called temporary abandonments and casing stubs). Fishermen often do not know they exist and, therefore, they cannot avoid these objects. However, existing mitigation reduces these conflicts. Also, the Fishermen's Contingency Fund (see Section

I.B.5 of the FEIS) will compensate for some losses resulting from these structures.

Onshore, competition between the oil and gas industry and commercial fishing industry can occur for berthing spaces and services. The significance of these impacts will depend on the specific port. Centaur Associates, Inc. (1981) has conducted a study for BLM on port conflicts. At most ports, use of ports by OCS vessels other than crew boats would not be feasible, would create moderate to high impacts to commercial fishermen, or would require extensive modification.

Vessel traffic will cause some conflicts with commercial fishing boats. A minor impact will be caused by supply and crew boats since fishermen will need to maneuver around them if these vessels cut across the fishermen's intended path. In foul weather, additional vessels traveling through an area can become a significant hazard, particularly if they do not maintain safe speed levels. The greatest vessel conflicts probably will be with seismic boats. Fishermen have noticed that after a seismic boat passes through the area, sonar shows that the fish move to the ocean bottom and subsequently no fish are caught. How long the fish remain on the bottom and the significance of this observation are unknown. Additionally, seismic boats pull a 2-mile long cable behind them that precludes fishing in the area while seismic work is being conducted. The cable also can become entangled with stationary fishing gear, resulting in disruption and potential loss of the fishing gear. This conflict could be reduced if the fishermen receive adequate notice of specifically where and when the seismic boats will be working so that the gear can be removed or its location can be clearly identified. If this conflict is not reduced, seismic boats may temporarily cause moderate to high economic impacts to the $55 million commercial crab fishing industry. Partial reimbursement for gear damage is available from the Fisherman's Protection Act which is described in 50 CFR Part 258 (see the Federal Register, Vol. 44, No. 208, pages 61546-61551, October 25, 1979, and Vol. 45, No. 53, page 17018, March 17, 1980).

The analysis above assumes that only the areas within the planning area with favorable geological characteristics will be developed. If some development occurs outside these favorable areas, development probably still would occur near important commercial fishing areas. Therefore, impacts to commercial fisheries are not expected to be less than those described above. In fact, if development occurs closer to the Klamath River area and a major oil spill occurs in this area, impacts to salmon fisheries are more likely to occur. Also, an oil spill in this area is more likely to create impacts to salmon fisheries in Oregon and Washington. Impacts to these areas are expected to be low.

As a result of all proposed activities discussed above, the commercial salmon fishery may sustain low to moderate economic losses for 5 years or more, the commercial trawl fishing industry may sustain moderate to high economic losses, and the commercial crab fishing industry may temporarily sustain moderate to high economic losses. Other commercial fisheries are expected to sustain short-term moderate to high economic losses. Since impacts from the proposal are expected to be restricted to short-term losses

for most fisheries and some fishermen can switch to a different fishery, the overall expected regional impacts on the commercial fishing industry are moderate. If the Wells and Pipeline Stipulation employed in specific areas for past Pacific OCS sales is adopted for each Central and Northern California sale, the potential for fishing conflicts with temporarily abandoned subsea wellheads will be reduced slightly. The adoption of additional discretionary mitigation measures which potentially reduce the expected spills would slightly decrease the likelihood that the commercial fisheries would sustain the impacts described above.

Conclusions. The commercial salmon fishery may sustain low to moderate economic losses for 5 years or more primarily due to catch loss from oil spills. The commercial trawl fishing industry may sustain moderate to high economic losses primarily due to loss of fishing space created by platforms and pipelaying activities. The commercial crab fishing industry may temporarily sustain moderate to high economic losses primarily due to loss of gear or fishing space created by seismic vessels. Other commercial fisheries are expected to sustain short-term moderate to high economic losses primarily due to loss of fishing space and time created by oil spills. Overall, the expected regional impacts on the commercial fishing industry are moderate.

Cumulative Impacts. In the unlikely event that all tracts offshore Central and Northern California are leased and developed during the life of the proposal (total resource development), the expected number of oil spills is 3.6 oil spills greater than 1,000 bbl and 1.9 oil spills greater than 10,000 bbl. An additional 10.5 oil spills greater than 1,000 bbl and 6.3 oil spills greater than 10,000 bbl are expected to result from import tankering of crude oil. An unknown number of oil spills are expected to occur from development of resources in State Tidelands. Since more than 14.0 oil spills greater than 1,000 bbl are expected, it is probable that one large oil spill may follow another in the same area. Therefore, the cumulative impact of these oil spills on commercial fisheries is expected to cause low to moderate economic impacts for several years due to impacts on fish and invertebrate populations, and short-term high economic losses due to preclusion of fishing. Although unlikely, if several major oil spills occur in the same area, high economic impacts on the commercial fishing industry could last several years.

Thirty-four platforms platforms are estimated for this area with total development of the resources. An unknown number of additional platforms may occur as a result of resource development in State Tidelands. The total fishing area that will be lost throughout the planning area from these structures will be very small. Additionally, several pipelines probably will be constructed. If these platforms and pipelines are placed in important trawl grounds, the cumulative impacts of platforms and mud mounds and trenches are expected to create moderate to high economic impacts to the commercial trawl fishing industry.

Vessel traffic from existing and future oil and gas activities, particularly seismic boat traffic, may create moderate to high impacts to the commercial crab fishing industry. The impacts of debris, temporarily abandoned subsea wellheads, and use of ports and harbors associated with total development of oil and gas resources offshore Central and Northern California (Federal and State) are not expected to be significantly different from the impacts described above for the proposal.

The commercial fishing industry also is stressed for other reasons such as fluctuations in fish populations, changes in market conditions, and restrictions on fish harvests. These other sources cause high economic impacts to the industry. Overall, the expected regional impacts on commercial fisheries due to cumulative impacts is high.

The proposal contributes less than 14 percent of the oil spills greater than 1,000 bbl, less than 12 percent of the oil spills greater than 10,000 bbl, less than 56 percent of the platforms and pipelines, and perhaps half of the oil and gas vessel traffic, but does not contribute significantly to the other impact agents discussed above. Since the non-OCS-related impact agents have the greatest impact on commercial fisheries, the contribution of the proposal to cumulative impacts on these fisheries is low whether cumulative impacts include development of all resources offshore Central and Northern California (total resource development), or only resources described for the alternative, currently leased lands and non-OCS related projects and proposals. However, even this small increase in cumulative impacts is significant since commercial fisheries are already very stressed.

c) Endangered and Threatened Species

(1) Endangered Species: The southern sea otter is considered in Section V.D.8.a.2)c)(2), Threatened Species.

Over life of the proposal, if the estimated 0.5 billion bbl are produced, 2.0 oil spills greater than 1,000 bbl and 1.0 spills greater than 10,000 bbl are expected to result from the Central and Northern California sales. Nineteen platforms are expected.

With two exceptions (discussed below), the species, habitat of species, impacts, and analysis are the same for Central and Northern California as for Southern California. The likelihood of impacts may be slightly lower for most species due to a lower predicted number of spills and fewer platforms. Section V.D.7.a.2)c)(1) contains additional detailed impact analysis information.

The exceptions mentioned above are as follows: 1) Impacts to the brown pelican are not expected to exceed low to moderate due to the fact that nesting only occurs in Southern California with a low likelihood of occurrence. The brown pelican occurs on the Farralon Islands which have a low likelihood of impact from the proposal. 2) The light-footed clapper rail does not occur in Central and Northern California but is replaced in estuarine habitats by the endangered California clapper rail. Impacts to the California clapper rail will be the same as those for the light-footed clapper rail, i.e. high or locally very high but with a low likelihood of occurrence due to the protected entrance to most estuaries.

Peregrine falcons, bald eagles, and endangered plant species should not be impacted. Endangered great whales have a moderate likelihood of low to moderate impacts from oil spills and a moderate likelihood of low impacts from noise associated with OCS activities. Impacts to sea turtles are low with a low likelihood of occurrence. Impacts to least terns could be high but with an expected low likelihood. Overall, expected regional impacts to endangered species should be low to moderate for whales and low for other species.

Multiple spills in the same area could elevate significant impacts at least one level (example, from high to very high) due to the inability of a population to recover before a second event. However, chances of 2 spills from this proposal hitting the same area are low.

Conclusions. As a result of the proposal, whales are likely to sustain low to moderate ecological impacts, and other endangered species are not expected to be impacted. However, although unlikely, the least tern and California clapper rail may sustain high ecological losses, and the brown pelican and sea turtles may sustain low ecological losses. Endangered plants, peregrine falcons and bald eagles should not be impacted. Overall, the expected regional impacts to endangered species are low to moderate since whales are an important part of endangered species in the region.

Cumulative Impacts. In the unlikely event all tracts offshore Central and Northern California are leased and developed during the life of the proposal (total resource development), the expected number of spills greater than 1,000 bbl is 3.6, the expected number of spills greater than 10,000 bbl is 1.8. Spills from import crude tankering are 10.5 and 6.3. If the projected spills from import tankering are added to the spills from the proposal, the respective number of spills would be 14.1 and 8.1. The State of California is also expected to continue development of its lands. It is assumed some platform placement and oil spills will result from the development of State Tidelands resources. In addition to oil from spillage, endangered species are possibly stressed by sewage outfalls and increased urbanization. If pollution levels remain constant or increase, some species may suffer low level impacts from several sources and a general degradation of health is possible. That is, some individuals may die but the species is expected to maintain a viable population. However, some species are expected to suffer very high impacts with or without the proposal due to the sensitivity of the habitats to increasing urbanization and oil spills and the already low population levels of these species. Therefore, the overall regional impacts are expected to be very high.

The proposal contributes less than 14 percent of the oil spills greater than 1,000 bbl, less than 12 percent of the spills greater than 10,000 bbl and less than 56 percent of the platforms. The proposal also contributes to drilling effluents but does not contribute to other impact agents mentioned above. Since oil spills from tankering and other non-OCS-related impact agents have the greatest impact on most endangered species in Central and Northern California, contribution of the proposal to cumulative impacts is considered low whether cumulative impacts include development of all resources offshore Central and Northern California (total resource development), or only resources described for the alternative, currently leased lands and non-OCS related projects and proposals.

(2) Threatened Species: The loggerhead sea turtle is discussed in Section V.D.7.a.2)c)(1). The impacts will be slightly lower than in Southern California due to fewer predicted spills. The southern sea otter is the only threatened species on the Federal list for Central and Northern California. It occurs primarily along the Central California coast from Pismo Beach to Santa Cruz. Current eslimates of population size range from 1,000 to 2,000 animals. The USFWS is considering translocating southern sea otters to extend their range and to make the population less vulnerable to oil spills.

In sea otters, maintenance of a warm body temperature is dependent on fur rather than blubber. Experiments indicate when the fur becomes fouled with oil, the animals go into hypothermia, and death usually ensues. If oil were to hit any of the sea otter colonies along the coast, impacts might be high.

Over the life of the proposal, if the estimated 0.5 billion bbl are produced, 2.0 oil spills greater than 1,000 bbl and 1.0 spills greater than 10,000 bbl are expected to result from the Central and Northern California sales. The majority of oil reserves are expected in the Santa Maria Basin just north of Point Conception.

It is moderately probable that one of the spills will hit a sea otter colony and deaths will result. It is possible that part of a colony will be eliminated, in which case there will be a high localized impact. Although unlikely, if spills should contact sea otter colonies more than once during the life of the sale, it is possible the impacts will be very high due to reduction in the gene pool. See Section V.D.8.a.6) for a discussion of irreversible and irretrievable resources in relation to the southern sea otter. Overall, sea otters are expected to suffer moderate regional ecological losses.

Conclusions. The sea otter is expected to suffer a high local impact during the life of the proposal. Overall, threatened species are expected to suffer moderate regional impacts from the proposal.

Cumulative Impacts. See Cumulative Impacts, Section V.D.8.a.2)c)(1) above, for total number of spills expected during the life of the proposal.

Increasing pollution and population levels over the next 30 years plus the cumulative spills from tankering may impact the sea otters at moderately high to high ecological levels, that is, part of the Southern California population would be eliminated and might not be able to return to previous levels. The potential for a very high population impact exists, that is, the Southern California population could be eliminated due to a reduction in the gene pool to such an extent that the southern sea otter could not recover. The State of California is also expected to continue development of its lands. It is assumed some platform placement and oil spills will result from the development of the State Tidelands resources.

The proposal contributes less than 14 percent of the oil spills greater than 1,000 bbl, less than 12 percent of the spills greater than 10,000 bbl and less than 56 percent of the platforms. The proposal also contributes to drilling effluents but does not contribute to other impact agents mentioned above. Although oil spills are one of the greatest impact agents on southern sea otters in Central and Northern California, contribution of the proposal to cumulative impacts is still considered to be low whether cumulative impacts include development of all resources offshore Central and Northern California (total resource development), or only resources described for the alternative, currently leased lands and non-OCS related projects and proposals.

d) Habitats and Resources of Special Concern

(1) Marine and Estuarine Sanctuaries: The Point Reyes/ Farallon Islands Marine Sanctuary contains the largest breeding colony of seabirds in California and is an important pinniped rookery. The waters of

the area are highly productive and are an important foraging area for the birds and pinnipeds.

There are two proposed marine sanctuaries, the Monterey Bay and surrounding waters and the Cordell Banks areas. Monterey Bay is proposed due to the rich bottom areas highlighted by a submarine canyon; Cordell Banks is proposed due to a shallow rise from the ocean floor. The impacts on the benthos, intertidal, fisheries, lands, and marine mammals which would occur in these marine sanctuaries are covered in Section V.D.7.a.2).

The types of impacts on the Point Reyes/Farallon Islands Marine Sanctuary are essentially the same as those for the seabirds and pinnipeds in Section V.D.7.a.2)d)(3) and V.D.7.a.2)d)(4). The likelihood of the impacts occurring, however, is less because the 19 platforms and 2.0 spills equal to or greater than 1,000 bbl and 1.0 spills equal to or greater than 10,000 bbl expected for Central and Northern California are significantly less than those expected in Southern California. The likelihood of impacts is probably low.

Overall, the expected regional impacts on the Point Reyes/Farallon Islands National Marine Sanctuary are low because of the low number of expected spills and the low likelihood of a spill reaching the sanctuary.

Conclusions. Although unlikely, seabirds and pinnipeds in the Point Reyes/ Farallon Islands Marine Sanctuary may sustain low to moderate losses. Overall, the expected regional impacts on marine sanctuaries are low.

Cumulative Impacts. In the unlikely event that all tracts offshore Central and Northern California are leased and developed during the life of the proposal (total resource development), the expected number of oil spills is 3.6 greater than 1,000 bbl and 1.9 greater than 10,000 bbl. An additional 10.5 and 6.3 oil spills respectively are expected to result from import tankering to the region. An unknown number of spills are expected to occur from development in State Tidelands. The cumulative impact of these oil spills remains low to moderate (see Section V.D.7.a.2)a)). The likelihood of such impacts occurring will be increased to moderate.

The proposal contributes less than 14 percent of the oil spills greater than 1,000 bbl, and less than 12 percent of the spills greater than 10,000 bbl, and, therefore, contributes a minor portion of the likelihood of oil spills reaching the sanctuary compared with the likelihood from cumulative impacts whether cumulative impacts include development of all resources offshore Central and Northern California (total resource development), or only resources described for the alternative, currently leased lands and non-OCS related projects and proposals.

Overall, the expected cumulative regional impacts on the marine sanctuary is moderate because of the number of tanker spills which have a high likelihood of reaching the Farallon Islands located so near the major seaport, San Francisco.

(2) Designated Areas of Special Concern: The definitions for the State-designated areas of special concern are discussed more fully in Section V.D.7.a.2)d)(2). Marine life refuges, ecological reserves and areas of biological significance (ASBS) are designed to protect intertidal and shallow water subtidal inhabitants. Additionally, the California Sea Otter Marine Life Refuge in Central California was established to protect

the sea otter population. From Point Conception to the Oregon Border there are 9 ecological reserves, 3 marine life refuges and 19 areas of special biological significance.

Oil spills will cause impacts of the type and extent discussed in Sections V.D.7.a.2)a)(1), (2) and V.D.7.a.2)c)(2). Except for the impacts to sea otters, which do not occur in the Southern California region, the impact types and scope will be similar to those mentioned for areas designated significant in Southern California (Section V.D.7.a.2)d)(2). These impacts are expected to be low for the shallow subtidal benthos, low to moderate for intertidal areas and high for sea otters. The likelihood of these impacts occurring as the result of the 2.0 spills over 1,000 bbl and the 1.0 spills greater than 10,000 bbl is moderate.

As with Southern California, impacts from pipelines to the designated areas of special concern in Central and Northern California may occur were they to be constructed in ASBS's. However, it is extremely unlikely the State of California would permit pipelines in these areas.

Overall, the expected regional impacts on the designated areas of special concern are moderate because of the likelihood of a spill reaching the sea otter population. The resulting high impacts on the sea otter population should cause a moderate ecological impact for the region.

Conclusions. The probability of an oil spill hitting at least one designated area of concern is high. The resulting impacts will be low to the shallow water subtidal benthos, low to moderate to intertidal communities, and high to sea otters. Overall, the expected regional impacts on designated areas of special concern are moderate.

Cumulative Impacts. In the unlikely event that all tracts offshore Central and Northern California are leased and developed during the life of the proposal (total resources development), the expected number of oil spills is 3.6 greater than 1,000 bbl and 1.9 greater than 10,000 bbl. An additional 10.5 and 6.3 oil spills respectively are expected to result from import crude tankering to the region. An unknown number of spills are expected to occur from development in State Tidelands.

The resulting total of 14.1 or more spills over 1,000 bbl and 8.1 over 10,000 bbl increases the likelihood of an impact occurring to high. The most probable impacts from a spill remain low (shallow subtidal benthos), low to moderate (intertidal), and high (sea otters). Increased severity of impacts to the communities of designated areas of special concern will primarily depend upon the number and frequency of oil spill hits on a particular habitat (see Section V.D.8.a.2)). Multiple oilings before a shallow subtidal benthic community or intertidal community can recover, could cause a high ecological loss to either type of community. This is particularly true of intertidal communities where the Santa Barbara spill caused a moderate impact (Straughan, 1970; Foster et al., 1971). Multiple spills could cause a very high impact to the sea otters. The likelihood of multiple spills causing these impacts is low.

The proposal contributes less than 14 percent of the oil spills greater than 1,000 bbl and less than 12 percent of the spills greater than 10,000 bbl,

and, therefore, contributes a minor portion of the likelihood of oil spills reaching the designated areas compared with the likelihood from cumulative impacts whether cumulative impacts include development of all resources offshore Central and Northern California (total resource development), or only resources described for the alternative, currently leased lands and non-OCS related projects and proposals.

Overall, the expected cumulative regional impacts on the designated areas of special concern are moderate because of the likelihood of a spill reaching the sea otter population. The resulting high impacts on the sea otter population should cause a moderate ecological impact for the region.

(3) Marine Mammals: More than 22 species of cetaceans (whales, porpoises, and dolphins) are found off the Central and Northern California Coast. Seven of these, the blue, humpback, sperm, gray, fin, sei and right whales, are classified by the Federal Government as endangered. Among the great whales, the gray whale uses nearshore waters to the greatest extent. Blue, sei, and humpback whales tend to be further offshore. Almost the entire population of gray whales, 15-20,000 animals, pass through the area twice annually during migration.

Five species of pinnipeds are found along the coast of Central and Northern California; four of these species, the elephant seal, Stellar's sea lion, California sea lion and harbor seal have breeding colonies along the coast. Northern fur seals, though present, do not breed in Central and Northern California.

Cetaceans use the entire Northern and Central coast. Pinnipeds, however, are more common north of Santa Cruz and south of Fort Bragg. All five species of pinnipeds use the Farallon Islands. See Section 7.a.2)d)(3) for a discussion of impacts on cetaceans and pinnipeds. Marine mammals breeding or migrating through Central and Northern California will experience the same types of impacts as those in Southern California. Breeding behavior in pinnipeds is similar to that described in Southern California. The potential impacts of an oil spill are considered moderate. The whales may also experience low to moderate impacts from a spill. However, impacts to whales and other cetaceans from noise and platform activity is expected to be low due to the differences in the continental shelf and a lower concentration of platforms. Additionally, though some northern fur seals may perish if oiled, the species will not be impacted at a high level in Central and Northern California because they do not breed there.

Over the life of the proposal, if the estimated 0.5 billion bbl are produced, 2.0 oil spills greater than 1,000 bbl and 1.0 spills greater than 10,000 bbl are expected to result from the Central and Northern California sales. The largest production and number of spills is expected from the Santa Maria Basin. Oil from this basin is more likely to impact the Northern Channel Islands in the SCB than areas north of San Simeon. (See Section 7.a.2)d)(3) for impacts in Santa Barbara Channel Islands.) Breeding pinnipeds, mainly north of Santa Cruz, have a low probability of sustaining moderate impacts. The gray whale and other whales could experience low to moderate impacts. The threatened southern sea otter is discussed in Section V.D.8.a.2)c)(2).

Mechanical cleanup equipment may be used to reduce oil impacts. Dispersants may be used to speed weathering of the oil and reduce impacts. Oil dispersants may, however, have more harmful effects on marine mammals than the oil itself (Dye, 1980).

The expected regional level of impact to marine mammals is low. High impacts are not expected due to the number and expected location of spills. Multiple spills in the same area could elevate significant impacts at least one level (example: from moderate to high) due to the inability of a population to recover before a second event. However, chances of two spills from this proposal hitting the same area are low.

Conclusions. As a result of the proposal, whales are likely to sustain low to moderate ecological impacts, and other marine mammals are expected to sustain low ecological losses. However, although unlikely, breeding pinnipeds may sustain moderate ecological losses and nonbreeding pinnipeds may sustain low to moderate impacts. Overall, the expected regional impacts are low.

Cumulative Impacts. In the unlikely event all tracts offshore Central and Northern California are leased and developed during the life of the proposal (total resource development), the expected number of spills greater than 1,000 bbl is 3.6, the expected number of spills greater than 10,000 bbl is 1.8. Spills from tankering are 10.5 and 6.3. If the projected spills from tankering are added, the respective number of spills would be 14.1 and 8.1. The State of California is also expected to continue development of its lands. It is assumed some platform placement and oil spills will result from the development of the State Tidelands resources.

The probability of oil from tankering being spilled in the vicinity of the Farralon Islands and Pt. Reyes is high to very high due to their proximity to San Francisco harbor. Expected impacts to pinnepeds could be high if they were breeding. In addition to oil from spillage, marine mammals are possibly stressed by sewage outfalls. With or without the proposal some species are expected to suffer moderate impacts over the life of the proposal. If pollution levels remain constant or increase, some species may suffer low level impacts from several sources and a general degradation of health is possible. Overall, the impacts are expected to be low to moderate; that is, some individuals may die but most species are expected to maintain viable populations.

The proposal contributes less than 14 percent of the oil spills greater than 1,000 bbl, less than 12 percent of the spills greater than 10,000 bbl and less than 56 percent of the platforms. The proposal also contributes to drilling effluents but does not contribute to other impact agents mentioned above. Since oil spills from tankering and other non-OCS-related impact agents are expected to have the greatest impact on marine mammals in Central and Northern California, contribution of the proposal to cumulative impacts is considered low whether cumulative impacts include development of all resources offshore Central and Northern California (total resource development), or only resources described for the alternative, currently leased lands and non-OCS related projects and proposals.

(4) Seabirds: Thirteen different seabird species, over 600,000 birds, breed on isolated spots of the coastline and on offshore rocks and islands. These nest areas occur along most of the coast, with heavy concentrations on the Farallon Islands, off San Francisco and Castle Island, Del Norte County. These two areas account for over 50 percent of the nesting seabirds of California. Common murres, Cassins auklets, western gulls, and Brants cormorants are the most common species. In addition, large (in excess of 2 million) migratory populations of shearwaters and phalaropes are present during May and June. For a discussion of impact agents and levels on sea-

birds, see Section V.D.7.a.2)d)(4) Southern California seabirds. Birds nesting or migrating through Central and Northern California will be susceptible to the same impacts as those in Southern California. Impact likelihoods will vary, however. Moderate to high impact levels could occur for nesting species and low to moderate impacts for migrating species. The brown pelican does not nest in Central and Northern California and would therefore also sustain low to moderate impacts.

Over the life of the proposal, production of the 0.5 bbl of estimated oil reserves in Central and Northern California are expected to result in 2.0 oil spills greater than 1,000 bbl and 1.0 spills greater than 10,000 bbl. Multiple spills in the same area could elevate significant impacts at least one level (example: from moderate to high) due to the inability of a population to recover before a second event. However, chances of two spills from this proposal hitting the same area are very low. The largest production and number of spills can be expected from the Santa Maria Basin. Oil from this basin is more likely to impact the Northern Channel Islands in the SCB than areas north of San Simeon. (See Section V.D.7.a.2)d)(3) for impacts in Santa Barbara Channel Islands.) Nineteen platforms are also expected along the Central and Northern California coast from this proposal.

If a spill were to hit the Farallon Islands, Pt. Reyes or Castle Rock during the breeding season, many birds, especially murres and auklets would probably perish due to oiling and hypothermia. Many animals might also die from exposure to toxic fractions, inhalation, and irritation to mucous membranes. If the juveniles were ready to fledge, the losses would increase substantially. However, populations would be expected to return to normal breeding potential in a few years. The probability of such a spill occurring is considered low due to only 2.0 spills predicted from the 0.5 bbl of oil expected along the entire Central and Northern California coast.

If other areas of the coast were hit by a spill the impacts would be lower due either to the migratory status of the impacted birds or fewer birds concentrated for nesting. There is a moderate to high probability of this occurring.

Mechanical cleanup equipment may be used to reduce oil impacts. Dispersants may be used to speed weathering of the oil and reduce impacts. Oil dispersants may, however, have more harmful effects on seabirds than the oil itself (Dye, 1980).

The number of platforms predicted for the coast is not expected to seriously impact seabirds. Although a high number of mortalities could occur in seabirds, overall the regional expected impacts to seabirds from Alternative I-1 are low. It is unlikely the dense concentrations of birds will be impacted and the small number of spills occurring over the entire coastline is not expected to impact seabirds regionally above a low level.

The behavior, physiology, and natural history of many seabirds is not well known. Therefore, the long-term impacts from chronic low levels of petroleum hydrocarbon pollution and continued drilling activities cannot be assessed.

Conclusions. As a result of the proposal, seabirds are expected to sustain low ecological losses. Although unlikely, nesting seabirds could experience moderate to high ecological losses, and migratory seabirds may experience low to moderate ecological losses. Overall, the expected regional impacts are low.

Cumulative Impacts. In the unlikely event all tracts offshore Central and Northern California are leased and developed during the life of the proposal (total resource development), the expected number of spills greater than 1,000 bbl is 3.6, the expected number of spills greater than 10,000 bbl is 1.8. Projected spills from tankering are 10.5 and 6.3. If the projected spills from tankering are added, the respective number of spills would be 14.1 and 8.1. Thirty-four platforms are also projected. The State of California is also expected to continue development of its lands. It is assumed some platform placement and oil spills will result from the development of the State Tidelands resources. The probability of oil from tankering being spilled in the vicinity of the Farallon Islands is high to very high due to their proximity to San Francisco Harbor. Expected impacts to seabirds would be high. In addition to oil from spillage, seabirds are possibly stressed by sewage outfalls. With or without the proposal, some species are expected to suffer high impacts over the life of the proposal. If pollution levels remain constant or increase, some species may suffer low level impacts from several sources and a general degradation of health is possible. Overall, the impacts are expected to be low to moderate; that is, some individuals may die but most species are expected to maintain viable populations.

The proposal contributes less than 14 percent of the oil spills greater than 1,000 bbl, less than 12 percent of the spills greater than 10,000 bbl and less than 56 percent of the platforms. The proposal also contributes to drilling effluents but does not contribute to other impact agents mentioned above. Since oil spills from tankering and other non-OCS-related impact agents have the greatest impact on seabirds in Central and Northern California, assuming 0.5 bbl reserves and the expected distribution number of spills discussed above, contribution of the proposal to cumulative impacts is considered low whether cumulative impacts include development of all resources offshore Central and Northern California (total resource development), or only resources described for the alternative and non-OCS related projects and proposals.

e) Air Quality: A discussion of the primary factors used in assessing onshore air quality impacts which may result from OCS-related activities and the method employed in quantifying the impact on this planning area are described in Section V.A.3 of this document.

Information on nonattain ment areas in the planning area is provided in Table V.D.8.a.2)e)-1 and illustrated in Figure V.D.8.a.2)e)-1.

TABLE V.D.8.a.2)e)-1
NONATTAINMENT AREAS IN THE CENTRAL AND
NORTHERN CALIFORNIA PLANNING AREA

State	Area	Nonattainment Pollutants
California	North Coast	TSP
	San Francisco Bay Areas	TSP, O_3, CO
	South Central	TSP, O_3, CO

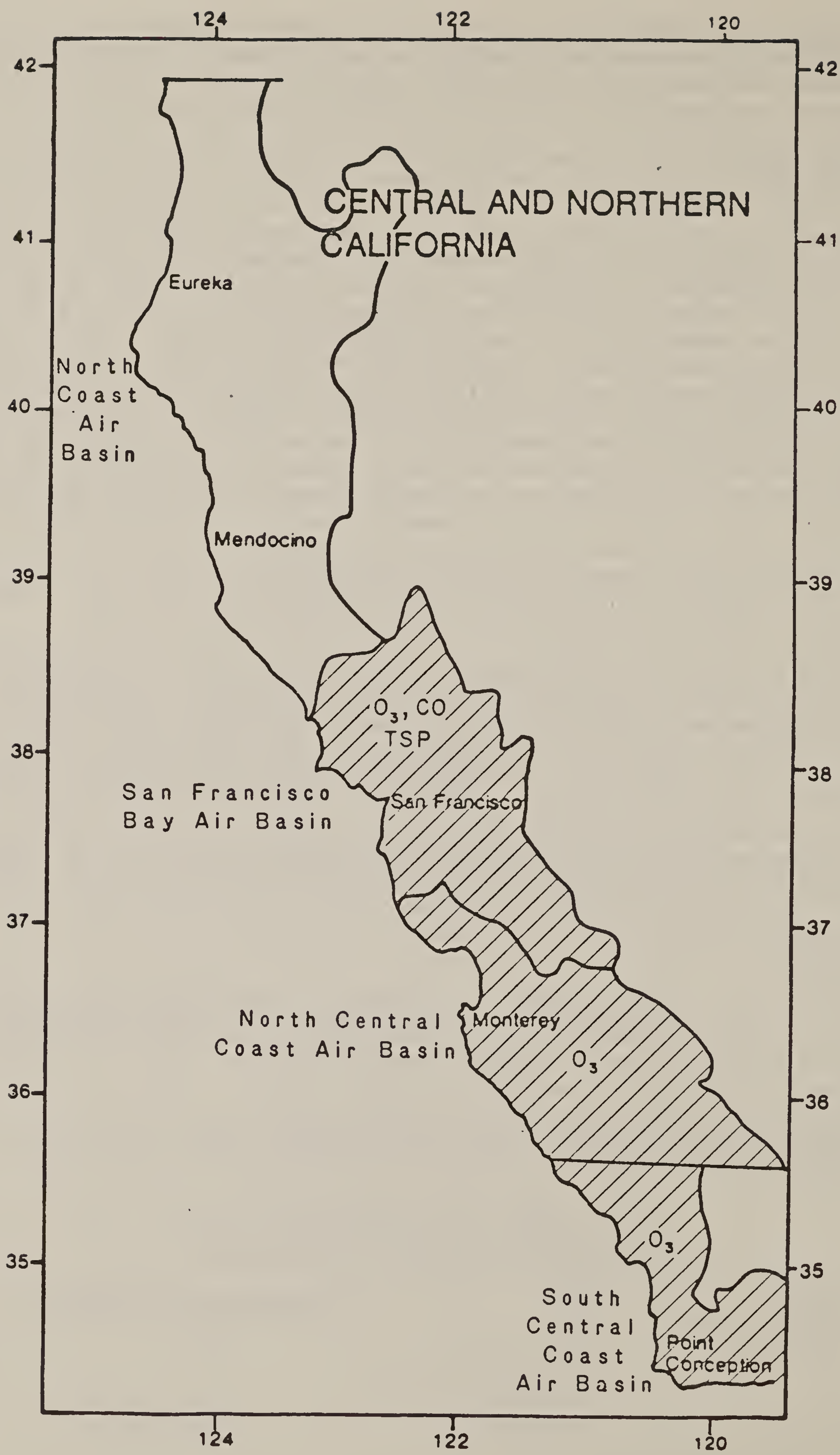


Figure V.D.8.a.2)e)-1 Central and Northern California Region

It is estimated that 90 exploratory wells will be drilled to identify the resources and 465 development/production wells and 19 platforms to develop the resources under this alternative. It was assumed, for the purposes of analysis, that production from an average platform would be 0.9 million barrels of oil and 1.2 billion cubic feet of gas per year. Three-quarters of the oil produced in the region is assumed to be transported by tanker or barge, while 1/4 will be transported through subsea pipelines.

Estimated representative emissions per platform for development/production operations are provided in Table V.D.8.a.2)e)-2.

TABLE V.D.8.a.2)e)-2
ESTIMATED REPRESENTATIVE EMISSIONS (PER PLATFORM)

Activity	Pollutant Emissions (tons per year)					Notes/Source
	VOC	NO_x	TSP	SO_2	CO	
Platform installation	16	465	22	31	75	ERG (1981) - assumes platform installation occurs over 9 months, includes all support activities
Development drilling	9	240	11	21	71	ERG (1981) - assumes 2 wells drilled at a time and 12 wells drilled per year, includes all support activities
Oil/gas production	3.8	100	3	5	26	ERG (1981) - assumes average production of .9 million barrels of oil and 1.2 billion cubic feet of gas per year - all activities including on platform operations and all support activities
Barging	29	5.8	0.2	0.4	0.8	ERG (1981) - all phases of barging including loading and unloading and transit to and from platform (platform is assumed to be 20 miles from shore and half of the oil produced is barged to shore)

Nineteen platforms are expected to be installed over the 38 million acres of the planning area. Cumulative onshore impacts due to the aggregate emissions from all these platforms are possible, but are unlikely to be serious if they occur at all. Each of the 19 platforms likely will affect the onshore coastal area for 5-10 years during exploration, platform installation, and development drilling and for about 30 years during the production phase. The installation of the 19 platforms will occur over a 10 year period. Total aggregate emissions loading appears high (if one multiplies the figures in Table V.D.8.a.2)e)-2 by 19 for each phase of operation). This total from the planning area can be calculated but is not a useful measure of the onshore air quality impacts. These impacts at a particular location are the critical factors and are dependant on the location of platforms, the phase of operation and its level of activity and the number of platforms that can potentially affect the onshore air quality at that location. In reality onshore impacts will be spread along the entire coastline in relationship to the location and distance from shore of the platforms. Only if several platforms were located close together and near to shore would cumulative impacts onshore be a significant problem. This is unlikely for two reasons: 1) it is generally more economical to develop an area from one platform, rather than drill from several smaller platforms scattered over a very small area and 2) if platforms are close together and cumulative impacts are possible, the onshore impact would be mitigated by the cumulative impact provisions of the DOI rules.

It was estimated that OCS facilities located within 20 miles of the Central and Northern California planning area coast would likely require emission controls. The hydrocarbon resources will be developed in areas within 20 miles of the coastline. Of the 19 proposed platforms associated with the development of the resources, approximately 15 are expected to be located in this near-shore offshore area, and will require emission controls. No new onshore refineries or gas processing plants are required under this alternative (see Land Use, Section V.D.8.a.1)d)).

A low qualitative impact is expected from routine emissions. Although several areas within the region are nonattainment for O_3, no new major onshore sources which would cause severe local impacts are forecast. Uncontrolled pollutant emissions from near-shore offshore sources will cause onhore air quality impacts in excess of the DOI air quality rules significant levels (these levels represent 2 percent of the NAAQS).

Platform emissions are compared to the DOI air quality rules allowable emissions level as determined by the exemption formulas (E=33.3D for TSP, SO_2 NO_x and VOC and $E=3400D^{2/3}$ for CO where E is the emission exemption amount expressed in tons per year and D is the distance of the proposed facility from the closest onshore area expressed in statute miles). If a facility is not deemed exempt by the exemption formulas, an approved air quality model is used to determine if the air emissions result in a significant onshore air quality impact. For example, assuming 3 months of development drilling occurs immediately upon completion of platform installation, 525 tons of NO_x could be omitted in 1 year based on the representative emissions. If this platform were located beyond 16 miles from shore, it would be exempt from DOI emissions controls.

Any emission sources which would adversely affect the onshore air quality would be subject mitigation required by EPA and the State, if located onshore, or by DOI, if located on the OCS. Required controls would conform with Best Available Control Technology (BACT), and emission offsets, if needed. A very thorough discussion of possible BACT for all phases of OCS operations can be found in ERG (1981) (pages VII-1 through VII-4). The control options discussed address the major emission sources: for VOC emissions from barging, use of vapor control lines are a possible control; for NO_x emissions from power generation, either cabling in onshore electricity or use of natural gas turbines; and for SO_2 emissions during the processing of sour gas, the installation of Claus Sulfur Recovery System. Fugitive VOC emissions from valves, pumps and lines are controlled by maintance.

If a blowout, oil spill, or fire were to occur at a platform near shore, short-term violations of several NAAQS could occur onshore, depending on the type and duration of the accident.

Conclusions. The level of expected impacts to air quality in the region is low. No new major onshore sources associated with the proposal are forecast.

Cumulative Impacts. It is estimated that a total of 0.9 billion barrels of oil and 1.2 trillion cubic feet of gas exist in the entire Central and Northern California Federal OCS planning area. Additional reserves underlie State Tidelands and onshore areas. In the event that total development of all Federal reserves occurs over the life of this proposal (total resource development), 34 new platforms with 845 wells would be required. It is very unlikely that this magnitude of development will occur over the life of this proposal.

The major influencing factors affecting the onshore air quality in Central and Northern California as a result of OCS development are: 1) the number of new wells drilled, 2) the location of the platforms, 3) the timing of the activities, 4) the magnitude of the produced products barged to shore, and 5) the local instantaneous meteorlogical conditions. Prevailing winds off Northern and Central California are from the west and northwest. Temperature inversions are present during most summer months and to a lesser extent during the winter. The proposal contributes moderately to regional cumulative air quality and from low to very high to localized cumulative air quality impacts.

The increase in oil and gas development anticipated as a result of the proposal will occur as the Central and Northern California area grows in population as a result of unrelated industrial and commercial growth in the region. In most cases, oil and gas activities will be a very small part of this overall growth whether cumulative impacts include development of all resources offshore Southern California (total resource development), or only resources described for the alternative and non-OCS related projects and proposals. The cumulative impact of this overall growth could increase ambient pollutant concentrations to a level where some future industries

would be forced to comply with stringent emission controls to avoid exceeding air quality standards. This may affect future economic conditions of Central and Northern California communities by restricting industrial development.

A possible significant cumulative air quality impacts may result from the increased level of transporting the produced products from the platforms to shore by barge. This impact could be minimized by the use of pipelines as the transport method. Another possible significant cumulative impact may result from the clustering of many platforms. This situation along with the barging of produced products to shore may result in very high localized cumulative impacts. This impact could be minimized by the piping of oil from the production platforms to shore, the application of the DOI air quality rules which have a provision to address the cumulative impact of many OCS facilities and the fact that clustering will probably not occur.

No significant cumulative impact is anticipated as a result of combined oil and gas development activities on State Tidelands and the OCS. The severity of air quality impacts will be influenced primarily by the number of oil and gas activities, their locations, and their timing. For example, emissions from additional platforms in some sections of Central and Northern California will be virtually undetectable due to high ambient pollutant levels. Conversely, platforms constructed and operated in areas with minimal human activity may significantly affect local air quality conditions. Overall, regional air quality impacts are expected to be moderate; local impacts will range from low to very high. However, EPA rules associated with the Clean Air Act and the DOI air quality rules have provisions to minimize these impacts.

f) Recreation and Tourism

(1) Coastal Recreation: Central and Northern California, although comprising 73 percent of the California mainland coastline, has an annual beach use participation of 38 million visitor days and about 20 percent of the economic value of California's coastal recreation. Morro Bay, Monterey/Carmel, Santa Cruz, San Francisco, and Mendocino are examples of tourist/recreation centers in the area. Several recreation areas are intensively used, such as the Point Reyes National Seashore and the Golden Gate National Recreation Area which had a combined attendance of over 14.9 million in 1980 (U.S. Park Service).

As in Southern California, the impact agents are platforms, pipeline landfalls, and oil spills. Impacts to recreation in Central and Northern California would be similar to those in Southern California with the platforms acting as visual intrusions, boating hazards, navigation aids, and artificial reefs. Pipelines landfalls will temporarily disrupt beach use, and oil spills will tend to close recreation areas as is stated in Section V.D.7.a. 2)f)(1). The impacts of offshore structures, pipelines, and oil spills will be lower than the potential impacts in Southern California with an expected 19 platforms and 2.0 oil spills greater than 1,000 bbl and 1.0 spills greater than 10,000 bbl expected to occur from the development of the resources. Recreation north of Point Conception tends to be more beach use oriented, whereas in Southern California water contact recreation comprises a significant portion of the recreation mix.

Sportfishing in Central and Northern California consists primarily of shore, pier, commercial passenger fishing vessel (partyboat), skin diving, and surf netting. Since shore and pier fishing comprise 80 percent of the total, sportfishing in this region would receive greater impacts from an oil spill reaching shore than from OCS offshore activity. Impacts on salmon and clam populations (see discussion in Section V.D.8.a.2)a) and b)(1) could cause moderate to high impacts to the sport fisheries for these resources.

As a result of all proposed activities discussed above, the impact of the proposal on the recreation of the area will be minor unless an oil spill contacts the shoreline. The impact could be localized and short term with only mild economic consequences but could become regional in scope and more economically damaging, as stated in Section V.D.7.a.2)f)(1). The loss to both beach and water recreation would be very high for the area where any large oil spill contacted. The exact economic impact cannot be stated as it is entirely dependent on conditions present at the time of the impact and has to include all associated cleanup costs and compensation. This loss would be significant to the local economies and as such should be considered as a high impact to localized areas. Overall, the expected regional impacts are moderate since the proposal is expected to cause very high impacts to some areas, and low impacts to other local areas.

Conclusions. As a result of the proposal, the loss to recreation, both waterborne and beach oriented, is expected to be very high for the area where any large oil spill contacts shore and overall moderate for the region.

Cumulative Impacts. The cumulative impacts for existing and future industrial and residential development; the development of existing offshore oil and gas leases, the proposal and future development (Federal and State) are expected to be greater than those previously listed. In the unlikely event that all the hydrocarbon resources on the Federal OCS are developed within the life of the proposal (total resource development), 3.6 oil spills greater than 1,000 bbl and 1.9 oil spill greater than 10,000 bbl can be expected. An additional 10.5 spills greater than 1,000 bbl and 6.3 spills greater than 10,000 bbl are expected to result from import crude tankering. An additional unknown number of spills is likely from State Tidelands hydrocarbon resource development.

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Conclusions. As a result of the proposal, the loss to recreation, both waterborne and beach oriented, is expected to be very high for the area where any large oil spill contacts shore and moderate for the region.

Cumulative Impacts. The cumulative impacts for existing and future industrial and residential development, the development of existing offshore oil and gas leases, the proposal and future development (Federal and State) are expected to be greater than those previously listed. In the unlikely event that all the hydrocarbon resources on the Federal OCS are developed within the life of the proposal (total resource development), 3.6 oil spills greater than 1,000 bbl and 1.9 oil spill greater than 10,000 bbl can be expected. An additional 10.5 spills greater than 1,000 bbl and 6.3 spills greater than 10,000 bbl are expected to result from import crude tankering. An additional unknown number of spills is likely from State Tidelands hydrocarbon resource development.

Thirty-four platforms are anticipated on the Federal OCS as a result of all development. In addition, development is expected to occur in State waters. The major impact would come from spilled oil which could affect general beach use and recreational boating in any area of impact. The proposal contributes less than 14 percent of the oil spills greater than 1,000 barrels, less than 12 percent of the spills greater than 10,000 barrels, and less than 56 percent of the platforms expected for the region. Since oil spills and platforms are among the most significant impact producing agents on coastal resources, the proposal contributes moderately to the cumulative impacts on this resource category whether cumulative impacts include development of all resources offshore Central and Northern California (total resource development), or only resources described for the alternative, currently leased lands and non-OCS related projects and proposals. When the total of 14 oil spills are considered with a projected beach attendance of over 60 million annual visitor days and increase in population and tourism over the life of the project, a very high impact to specific coastal recreation opportunities may be expected. Overall, the expected regional impacts are moderate.

(2) Visual Resources: Social, economic, cultural, and philosophic backgrounds greatly vary one's perception of esthetic values. The sight of an offshore structure may significantly decrease one observer's enjoyment of the coast, while another would be unaffected. Using a landscape-architectural viewpoint, the potential impacts on visual resources from OCS development have been identified (The Granville Corporation, 1981). Other impacts on visual resources which are more difficult to ascertain are beach usage, reduced recreational spending, decline in property values, and reduction in residential enjoyment.

Offshore oil and gas development and related onshore support facilities will have an adverse impact on visual resources, the degree depending upon the nature and number of the facilities and their location. Visual resource degradation could decrease recreational enjoyment of the beaches and coastal waters for some people. Onshore visual impacts during exploration could entail land use changes for equipment storage, heliports, communication and navigation equipment facilities, increased vehicular traffic, and construction activities. During the development stage, onshore storage and processing facilities, pipeline installation, and pipeline and barge fabrication and equipment storage yards will all involve some deterioration of the visual resource onshore. Sensitive design, siting, choice of materials, and landscaping could reduce the visual impact of these installations.

Onshore, a localized high impact could occur wherever new associated onshore facilities are sited if no existing facilities or suitably zoned sites are available. However, over the entire area, this impact is expected to be low due to the Coastal Commission regulations and due to the fact that only storage and supply bases will be constructed. No processing plants are expected to be constructed on the Central and Northern California Coast as a result of this proposal.

Offshore platforms will cause the longest lasting, most prominent visual impact. The platforms are fairly prominent objects, exhibiting discordant vertical and angular lines against the soft horizontal plane of the sea. Portions of a 190-foot platform structure may be seen from the water's edge if it is located within 17 miles of the shoreline. From elevated vantage

points, the visual range increases in proportion to elevation. At distances beyond about 15 miles, the size of platforms would appear very small and may be obscured by natural sea haze from 40 to 60 percent of the time. Dense fog and haze may obscure platforms situated at the 3-mile limit from 5 to 30 percent of the time, depending upon local climatic features (Naval Weather Service. 1976).

This proposal would necessitate the installation of 19 platforms in the Federal OCS off the Central and Northern California Coast. The exact positioning of these is unknown; however, it is anticipated that they will be grouped in the areas with favorable geological characteristics. This would tend to place the platforms off Eureka, the Mendocino Coast, Bodega, the San Mateo Coast, and the San Luis Obispo-Santa Barbara Coast. The impact experienced by this placement could range from very low to very high depending upon the specific location.

A significant visual impact could occur onshore in the event of a major oil spill. Accidental spills could occur as a result of vessel loss, production equipment failure, pipeline ruptures, or well blowouts. Some low-level spillage will occur during the course of normal operations. The duration of oil fouling on the beaches ranges from a few days to years, depending upon the type and amount of spillage, extent of cleanup efforts, beach sand transport mechanisms, and oil composition. Any oil fouling of beaches would have an adverse effect on visual quality until the oil is removed by either cleanup efforts or natural processes.

If a spill does occur and impact the beach, a very high visual impact would occur in the area of contact. The 2.0 spills over 1,000 bbl and 1.0 spill greater than 10,000 bbl which are anticipated to occur in Central and Northern California from the proposal and all have a moderate chance of impacting the beach.

If the proposal-related development occurs as stated, impacts can be expected locally to visual quality in those areas where development occurs. The exact amount of degradation will depend upon the location and type of the OCS structure and/or spill, and the nature of the shoreline that is impacted. Overall, the regional impacts on visual resources are expected to be moderate since the proposal is expected to cause very high impacts to some local areas and virtually no impact to other local areas.

Conclusions. The proposal is expected to cause very high impacts to some local areas where platforms are concentrated or where a large oil spill reaches shore. Overall, the expected regional impacts on visual resources are moderate.

Cumulative Impacts. Cumulative impacts to visual resources from existing and future industrial and residential development, the proposal, the development of existing Federal offshore oil and gas leases and the future development of State Tidelands (oil and gas) are expected to be greater than the impacts already listed. The major impacts to visual resources would come from three main sources: spilled oil, offshore structures, and onshore development.

In the unlikely event all resources in the Federal OCS offshore Central and Northern California are leased and developed within the life of the proposal (total resource development), 3.6 oil spills greater than 1,000 bbl and 1.9 oil spill greater than 10,000 bbl are anticipated. An additional 10.5 spills

greater than 1,000 bbl and 6.3 spills greater than 10,000 bbl are expected to result from import tankering. There are 34 platforms expected on the Federal OCS from the development of all resources in the area. Impacts locally would range from high to very high, depending upon the location. In addition, development is expected to occur in State waters with an unknown number of additional platforms. Also, the increase in onshore development can be expected to increase the impact in the area. Thus, a very high impact on visual resources could be expected for those parts of the area where development occurs.

The proposal contributes less than 14 percent of the oil spills greater than 1,000 barrels, less than 12 percent of the spills greater than 10,000 barrels, and less than 56 percent of the platforms expected for the region. Since oil spills and platforms are among the most significant impact producing agents on visual resources, the proposal substantially contributes to the cumulative impacts on this resource category whether cumulative impacts include development of all resources offshore Central and Northern California (total resource development), or only resources described for the alternative, currently leased lands and non-OCS related projects and proposals. Overall, the expected regional impacts are moderate.

g) Socio-economic Factors: Impacts to the socio-economic environment result from exploration, development, and production of OCS hydrocarbon deposits. Changes in the socio-economic environment also can result from development of additional onshore OCS-related infrastructure and increased demand for services by those economically dependent on OCS activities. The impacts for this alternative have been evaluated for the peak activity year 1990.

Cumulative impacts to the Central and Northern California coastal socio-economic environment are the results of total development of OCS oil and gas resources on the Federal OCS offshore Central and Northern California, expansion of Port San Luis, State Tidelands development, and the proposed Sacramento Coal Terminal, and continuing development pressures and population growth.

(1) Employment: Changes in employment potential could result from exploration, development, and production activities in the Central and Northern California OCS. Employment may also be increased from OCS-related investments onshore and increased demand for services by those employed in OCS-related activities. Employment is expected to be increased by 8,100 or 0.3 percent of the anticipated 1990 employment (DOI, 1980a). Most of the increased employment opportunities are expected to be filled by people moving into the State.

The anticipated increase in employment may result in a minor change in the economic structure of Central and Northern California. However, if all employment increases were to occur outside of the San Francisco Bay - San Jose portion of the planning area, significant structural changes in the local economies could be expected. The change in employment opportunities will also result in a slight modification to the economic structure in Central and Northern California.

Conclusions. The increase of 0.3 percent in employment opportunities is considered to be an insignificant contribution to the economy of any region

or locality. Overall, the impacts from this alternative are expected to be very low.

Cumulative Impacts. In the unlikely event that all tracts offshore are leased and all resources are developed (total resource development), cumulative impacts from this alternative and other projects will result in a high impact (the addition of 334,600 jobs or 11.5 percent of the jobs in 1990). Total OCS development is expected to provide 4.3 percent of the increased jobs. A contribution of 11.5 percent of the anticipated increase in employment is significant; however, the increase from the proposal is less than 0.3 percent of the 1990 population and is considered to be very low whether cumulative impacts include development of all resources offshore Central and Northern California (total resource development), or only resources described for the alternative, currently leased lands and non-OCS related projects and proposals.

(2) Population and Demography: Central and Northern California population is expected to increase as a result of OCS activities anticipated to occur from this alternative. Population is expected to increase by 16,500 or 0.25 percent of the forecasted 1990 population (DOI, 1980a). The increase in population is the result of increased employment from this alternative and the approximately 2.04 people supported from each new job created. The families of those directly employed in OCS development are expected to be young and have children of school age.

The additional population resulting from this alternative are most likely to settle in the existing urban areas of the region because of existing housing and public services and facilities. The increased population is expected to be spread throughout the planning area, and no significant disruptions are expected. In the unlikely event that the entire population change were to occur in the less populated portions of the region, significant dislocations in the local socio-economic environment and temporary housing shortages could result.

Conclusions. The 0.25 percent increase in population expected as a result of this alternative is considered to be insignificant on a regional or local basis. Overall, the impact on population is expected to be very low.

Cumulative Impacts. In the unlikely event that all tracts offshore are leased and all resources developed (total resource development), cumulative impacts from this alternative and other projects will result in a population change of 653,750 in 1990. The population change accounts for 9.6 percent of projected 1990 population and, therefore, is considered moderate impact. OCS-related development from this proposal is expected to account for 2.5 percent of the change. The contribution to the cumulative increase in population from this alternative is very low. The cumulative change is less than 1.0 percent of the total 1990 population and is considered to be low whether cumulative impacts include development of all resources offshore Central and Northern California (total resource development), or only resources described for the alternative, currently leased lands and non-OCS related projects and proposals.

(3) Public Services and Facilities: Increased demand for public services and facilities will result from the increased economic activity and population growth anticipated from this alternative. The impact of increased demand is dependent on the local communities' ability to fund modifications to public facilities and services and the existing capacity of those facilities and services.

Water supply is the only public service or facility to be significantly impacted on a regional level (Section V.D.8.a.1)a)(2)). Isolated cases of local stress may arise from development related to this alternative; however, which communities will incur these difficulties are not known because of the unknown magnitude of change in any community or county.

Insignificant impacts on most public facilities and services are expected to occur on the regional level as a result of this alternative. Water supply is very likely to suffer significant impacts on the regional and local levels.

Conclusions. Insignificant regional and local impacts to most public facilities and services are expected as a result of this alternative. Overall, the impacts from this alternative are very low.

Cumulative Impacts. In the unlikely event that all tracts offshore are leased and all resources developed (total resource development), cumulative impacts from this alternative and other projects would result in a significant impact on water supply. Other public facilities could be significantly impacted on a more local basis, and include sewage treatment, roads, and schools. The contribution of this alternative to the cumulative impacts is low in whether cumulative impacts include development of all resources offshore Central and Northern California (total resource development), or only resources described for the alternative, currently leased lands and non-OCS related projects and proposals. However, the overall cumulative impacts are moderate.

3) Impacts on Other Management Plans: The impacts on other management plans are substantially the same for Central and Northern California as described for Southern California (Section V.D.7.a.3)). The proposal could affect the plans for expansion of Port San Luis and Avila Bay, in that more space for recreational type of boating and vehicle traffic may be desirable due to population increases. The proposal could affect water quality planning in Central and Northern California to a greater degree than Southern California requiring stricter discharge guidelines to maintain water quality in the former. The USFWS Southern Sea Otter Recovery Plan (transplanting from Central and Northern California) could be affected by the proposal for developing Central and Northern California reserves. The proposal could affect the plans for the Point Reyes, Farallon Island National Marine Sanctuary, the proposed Monterey Bay and Surrounding Waters Marine Sanctuary, and the Ardell Banks Marine Sanctuary.

4) Unavoidable Adverse Impacts: The unavoidable adverse impacts are the same for Central and Northern California as described for Southern California (Section V.D.7.a.4)). Salmon fisheries may experience impacts for 5 years or longer after OCS activities cease.

5) Relationship Between Short-Term Uses of Man's Environment and Long-Term Productivity: The relationship between short-term uses of the environment and long-term productivity for Central and Northern California are as described for Southern California (Section V.D.7.a.5)).

6) Irreversible and Irretrievable Commitment of Resources: The irreversible and irretrievable commitment of resources is the same as described for Southern California (Section V.D.7.a.6)). In addition, the southern sea otter may experience significant impacts. Due to oil spills reducing the size of the southern sea otter population beyond its capacity to

THE MORE SIGNIFICANT ENVIRONMENTAL CONSEQUENCES

Central and Northern California Resource Category	Level of Expected Impacts[1/]	
	Scheduled Sales Only Under Alternative I-1	Cumulative Impacts of All Activities
1. General Impacts		
a. Water Quality and Supply		
Water Quality	low	moderate
Water Supply	moderate	high
b. Navigation		
Ports and Harbors	moderate to high	high
Marine Traffic	low	moderate
c. Other Uses of the OCS		
Ocean Dumping	very low	very low
Military	low	low
Offshore Oil and Gas Infrastructure	n/a	n/a
d. Land Use (OCS-related Infrastructure)	very low	moderate
e. Cultural Resources		
Offshore	low	low to moderate
Onshore	low	moderate
2. Impacts of Special Concern		
a. Coastal Ecosystems		
Intertidal	low to moderate	moderate
Subtidal Benthos	low to moderate	moderate to high
Wetlands	low to moderate	moderate
b. Commercial Fisheries		
Fish	low	high
Fisheries	moderate	high
c. Endangered & Threatened Species		
Endangered Species	low to moderate	very high
Threatened Species	moderate	moderate to high
d. Habitats and Resources of Special Concern		
Marine & Estuarine Sanctuaries	low	moderate
Designated Areas of Special Concern	moderate	moderate
Marine Mammals	low	low to moderate
Seabirds	low	low to moderate
e. Air Quality	low	moderate
f. Recreation & Tourism		
Coastal Recreation	moderate	moderate
Visual Resources	moderate	moderate
g. Socioeconomic Factors		
Employment	very low	high
Population & Demography	very low	moderate
Public Service & Facilities	very low	moderate

1/ Definitions of levels of impact are provided at the beginning of Section V.D.

(This table also applies to Alternatives I-2, II, and IV. See text.)

rebound, genetic variability which controls the fitness of a population in a varied environment may be reduced with irretrievable loss of adaptability of the otter to environmental perturbations.

b. Alternative I-2: The Proposed Schedule with Offerings of Favorable Geological Acreage

The impacts of Alternative I-2 are essentially the same as those described under Alternative I-1 as the bulk of the analysis for Alternative I-1 was based upon the assumption that only leasing and development of areas with high resource potential would occur.

See Section V.D.7.b. for additional discussion.

c. Alternative II: The April 1981 Draft Schedule

The analysis of this alternative is basically the same as for Southern California (Section V.D.7.c). However, because of the observable lack of support infrastructure in most areas of Northern and Central California, the possible lack of adequate lead time for planning the infrastructure and public services and facilities development could result in a greater impact. Impacts to planning for land use and public service and facilities could range from medium to high depending upon detail and completeness of existing plans and programs (general plans, LCPs and capital improvements programs).

A local jurisdiction's inability to respond to an unanticipated or unplanned impact may result in more significant consequences in Northern and Central California than described in Alternative I-1. The degree of potential impact cannot be measured at this time due to the fluctuating budget situation at Federal and State levels and the scheduling of LCPs.

d. Alternative III-1: The Current Schedule, The Current System - No Action

The description of Alternative III-1 is provided in Section III. The data on resources, expected spills associated with the exploitation of the stated resources, and the infrastructure required for resource development is reiterated in the subsections below, as appropriate for individual resource categories.

The following discussion pertains to cumulative impacts and the contribution of Alternative III-1 to the cumulative impacts on resources in the planning area.

The resource estimates, expected spills, infrastructure, and timing of development for the cumulative impact case is also described in Section III. The estimates remain the same for each alternative described in this document as they are provided for total development of resources on the Federal OCS. The estimates include proven and unproven reserves, leased and unleased lands. In short, the estimates include all hydrocarbons predicted to occur within the entire planning area.

In addition to resource development on the Federal OCS, State Tidelands development and other existing and proposed projects (including such things as crude import tankering, non-OCS activity-related population growth,

military projects, sewage and other waste disposal, port expansion) all must be considered in an analysis of cumulative impacts on each resource category.

This has been done for the entire Central and Northern California planning area and is provided for each resource category in Alternative I-1, Section V.D.8.a. Again, overall with all resources developed and existing and proposed projects and nonresource development activity considered, cumulative impacts to the resources are the same for each alternative. However, the contribution of the resource development from any specific alternative to the cumulative impacts in the planning will vary.

Development resulting from continuing with the present schedule (Alternative III-1) is expected to contribute the following percentages of the total predicted, or cumulative, impacts to the Central and Northern California planning area: less than 6 percent of the crude oil spills greater than 1,000 bbl and less than 5 percent of the crude oil spills greater than 10,000 bbl; less than 24 percent of the platforms; less than 22 percent of the exploration wells, and less than 23 percent of the development and production wells. In general, this contribution overall is considered minor but may be significant for individual resource categories. In general, this contribution is not substantial, but is expected to be low to moderate.

1) General Impacts

a) Water Quality and Supply

(1) Water Quality: Alternative III-1 may lead to water quality degradation in the Central and Northern California OCS region due to the same impact agents as described for Alternative I-1 (Section V.D.8.a.1) a)(1)). The level of impacts should be lower than the impact level expected from the first alternative because estimated resources are lower but impacts are still expected to be low. The number of spills and volumes of discharges are also lower than for Alternative I-1.

The number of statistically expected oil spills under Alternative III-1 is 0.8 for spills greater than 1,000 barrels and 0.4 for spills greater than 10,000 barrels. This is less than one-half the number of spills expected in the two categories under Alternative I-1. The level of impact is expected to be low in the Central and Northern California region. A spill migrating into Morro Bay, Bodega Bay, Tomales Bay or any of the smaller bays or estuaries in Central and Northern California would be an exception to low impacts. In these sensitive areas, the level of impact to water quality and subsequently to marine organisms would be very high (see Section V.D.8.a.1)a)(1)) for additional discussion of impacts).

Drilling mud and cuttings will be discharged into the ocean under Alternative III-1 in the following volumes: muds 6.87×10^5 barrels; cuttings 6.29×10^4 cubic yards. The likelihood of impacts from these two types of discharged materials is high (routine discharge). The level of impacts are expected to be lower by about one-half than the levels discussed for Alternative I-1 (Section V.D.8.a.1)a)(1)). The mode and sites of impacts from muds and cuttings are as described in Section V.D.8.a.1)a)(1).

Formation water and sewage will be discharged into the ocean under Alternative III-1. Formation water volume is expected to be about 1.6 x 10^8 barrels over the life of the project with the major part of the total volume being discharged toward the end of the development period. The impact level of this discharge is expected to be less than one-half the level discussed for Alternative I-1 and, therefore, still very low for the Central and Northern California OCS area. The likelihood of this impact is high because this is a routine discharge procedure. The level of impact from sewage discharge is very low and is less than that described for Alternative I-1. Likelihood of impact from sewage at the level described above is high. The modes and sites of impacts of formation water and sewage are as described in Section V.D.8.a.1)a)(1) and Section V.D.7.a.1)a)(1).

Sediment resuspension impacts are as described in Section V.D.8.a.1)a)(1) but at a slightly lower level due to fewer expected platforms (19 vs. 8) from Alternative III-1.

Conclusions. The water quality in the Central and Northern California OCS area would be degraded to a slight degree from activities associated with the proposed alternative. The level of expected impact will be less than the level expected for Alternative I-1 but still low for the region. The level of impact is expected to be moderate around the points of discharge.

(2) Water Supply: Impacts of this alternative will be considerably lower than those described under the proposal. Water demand resulting from OCS population increase will be about 1,476 AFY (481.0 million gallons a year). This is about 1,814 AFY less than the water requirements under the proposal, about 49 percent less in water needs.

Under this alternative, facilities will require about 707 AFY of water (230.5 million gallons a year). This is about 1,000 AFY less than the needs under the proposal, about 41 percent less in water demand. The estimated number of wells is 229 for both exploration and development.

Total water requirements under this alternative are estimated at about 2,180 AFY (711.5 million gallons a year), only about 44 percent of those needed under the proposal. Affected areas should experience low rather than moderate impacts under the proposal since impacts there would be 326 fewer wells needed for exploration and development. Also, there will be a smaller population increase under this alternative. If this alternative is adopted, the likelihood of these impacts occurring is high assuming consumption levels remain constant.

Conclusions. OCS-related activities will cause an increase in demand for water in the planning area, but lower than that under the proposal. Central California may experience higher impacts than the rest of affected areas, but the level of impact will be lower than that under Alternative I-1. It is expected that regional impacts will be low, but the magnitude will depend on OCS employment and facility locations.

b) Navigation

(1) Ports and Harbors: The impacting agents on ports and harbors are oil spills and increased shipping activity. A discussion of these agents and the effects of those impacting agents is presented in Section V.D.8.a.1)b)(1). Since the resource estimates for Alternative III-1 are approximately 60 percent less than those for Alternative I-1, there are correspondingly less oil spills that are predicted to occur. For Alternative III-1, it is expected that 0.8 oil spills greater than 1,000 bbl and 0.4 oil spills greater than 10,000 bbl will occur.

Despite the fewer expected oil spills, the impacts and likelihood of those impacts on ports and harbors from oil spills and increased shipping activity will not differ significantly from those discussed for Alternative I-1. However, adoption of this alternative is expected to result in moderate impacts to ports and harbors rather than moderate to high for Alternative I-1 primarily due to less competition for vessel berth space and support facilities on both a local and regional basis.

Conclusions. Adoption of this alternative is expected to result in moderate impacts to ports and harbors rather than moderate to high for Alternative I-1 primarily due to less competition for vessel berth space and support facilities on both a local and regional basis.

(2) Marine Traffic: Following the implementation of Alternative III-1, offshore infrastructure and hydrocarbon-related marine traffic will increase and thereby impact other marine traffic. A discussion of these impacting agents is given in Section V.D.7.a.1)b)(2). Since the resource estimates for Alternative III-1 are approximately 60 percent less than those for Alternative I-1, there is correspondingly less infrastructure and marine traffic that is predicted to result. Exploration and development activities following the proposed lease sales described in Alternative III-1 would result in 38 exploratory wells, 191 development/production wells, and 8 new platforms in the Central and Northern California area. Impacts on marine traffic should not differ significantly from those in Alternative I-1 (i.e., low level impacts) despite the fact less activity is expected to result. However, the likelihood of these impacts is reduced from high to moderate during peak periods (1985-1989) of proposal-related activities. Additionally, this peak activity would begin one year earlier (1986) than in Alternative I-1.

Conclusions. Impacts, and the likelihood of these impacts occurring, associated with the adoption of Alternative III-1 on marine traffic should not differ significantly from those discussed for Alternative I-1 (i.e., low level impacts). However, due to the lower level of activity following implementation of Alternative III-1 compared to Alternative I-1, the likelihood of small impacts on marine traffic should be reduced from high to moderate during peak-activity periods (1985-1989). Overall, the expected impacts on marine traffic are low.

c. Other Uses of the OCS

(1) Ocean Dumping: The adoption of this alternative

results in 8 expected platforms as opposed to the expected 19 for Alternative I-1. The expected number of wells are also lower by more than half of Alternative I-1. This results in a lower likelihood of an impact occurring from that stated for Alternative I-1; however, any impact that does occur will remain as that listed for Alternative I-1 both in scope and effect.

Conclusions. The likelihood of an impact occurring will be very low, and the overall expected impacts to the region are very low. Locally, the expected impacts are also very low.

(2) Military: Maintaining the present lease sale schedule and tract selection system (Alternative III-1) would result in slightly fewer impacts on military operations by oil industry activity in comparison to the proposal. The expected number of platforms is 8 (versus 19 for the proposal). A significantly smaller amount of acreage would be considered for leasing for Alternative III-1 than Alternative I-1, thereby reducing possible space-use conflicts and narrowing the scope of negotiations to those concentrated areas of high industry interest. Tract specific sales would also eliminate the possibility of scattered oil industry activity and their potentially large impacts of reducing the military operating areas. It is expected, however, that all activity by the oil industry will take place in the areas identified as having high resource potential.

The level of regional impact on military activities is expected to be low, as the current space requirements of the military leave much of the OCS open for other uses. The likelihood of impacts is low-to-moderate, with minimal overlap of military usage areas with areas of high industry interest. The main exception to this is the area between Point Sal and Point Conception, where Vandenberg AFB conducts regular, extensive operations, and the oil industry has expressed high interest. Parts of this area have been leased before (Lease Sale No. 53) after successful negotiations and the application of the standard military stipulations. Potential impact to this area is high. If the standard military stipulations are applied as in the past, Pacific OCS sales, impacts would be adequately mitigated to all areas.

Conclusions. Overall, low levels of impact to military operations can be expected regionally from Alternative III-1. In certain local areas, such as the area between Pt. Sal and Pt. Conception, high impacts are expected due to extensive military operations.

(3) Offshore Oil and Gas Infrastructure: Presently, no permanent infrastructure exists offshore Central and Northern California. Therefore, no impacts of the nature described in Section V.D.7.a.1)c)(3) on permanent infrastructure in the planning area will occur.

d) Land Use: The impacts of this alternative are less than those associated with Alternative I-1. The difference in impacts between this alternative and Alternative I-1 are not as dramatic as the difference between alternatives on employment or population (Section V.D.8.d.2)g)(1)-(2)). Impacts are maintained at a higher proportionate level because the development of infrastructure for eight platforms throughout the planning area allows for less common use and, therefore, higher per platform infrastructure development.

Development of infrastructure is expected to occur as a result of development of the resources for this alternative. Significant impacts on coastal land use is likely to occur in the Santa Maria Basin, while insignificant impacts will occur throughout the remainder of the region.

<u>Conclusions</u>. Significant impacts will occur on land use and in harbors with permanent facilities that will service the Santa Maria Basin. There will be insignificant impacts on land use and harbors throughout the region. These impacts are the same as those for Alternative I-1. Overall, the impacts from this alternative are very low.

e. Cultural Resources

(1) Offshore Cultural Resources: Alternative III-1 involves 50 percent less development activities than the proposal. For cultural resources, this translates into fewer bottom-disturbing activities. There are 8 proposed platforms instead of the 19 expected with Alternative I-1, 229 exploration, development, and production wells instead of 545, fewer pipelines to platforms, and a lower potential for other bottom-disturbing activities. There will be a reduction in the possibility of illegal collecting by divers due to the fact that fewer platforms necessitate fewer divers. With less development, there will be fewer sources of magnetic anomalies and thus less chance of masking the signature of a historic resource. The likelihood of impact is reduced because of the lower number of impacting activities.

Use of the Cultural Resource Protection Stipulation may reduce the level and likelihood of impacts to cultural resources. Even with the Stipulation, as in past sales, there will be some loss to the resource.

<u>Conclusions</u>. The impact to submerged cultural resources is expected to occur from the same sources as in Alternative I-1, that is, bottom-disturbing activities, human activity, and magnetic anomalies. The likelihood of these impacts is much lower under Alternative III-1 than under Alternative I-1, but overall, the level of impact is still expected to be low. There may be some localized low to moderate impacts.

(2) Onshore Cultural Resources: This alternative will result in over 50 percent less offshore development than is expected to occur with Alternative I-1. There will be correspondingly fewer onshore-related impacts to cultural resources. Lower resource estimates (from .47 billion bbl oil and .66 TCF gas in Alternative I to .19 billion bbl oil and .27 TCF gas in Alternative III-1) lowers the probability of facility expansion and other surface-disturbing activities. Fewer platforms, 8 instead of 19, and associated pipelines will result in fewer impacts to terrestrial sites from pipelines and fewer visual impacts to ceremonial activities of Native Americans and other ethnic groups. Fewer oil spills, 0.8 spills versus 2.0 spills greater than 1,000 bbl and 0.4 spills versus 1.0 spills greater than 10,000 bbl, translates into fewer impacts to terrestrial sites during cleanup and to intertidal areas utilized for subsistence and ceremonial use gathering.

The expected level of impact occurring in Alternative III-1 is low region-wide. Localized impacts may occur with a low to moderate likelihood. If applicable State and local laws and regulations are used, the potential for impact will be further reduced.

Conclusions. Alternative III-1 results in less offshore development than Alternative I-1 and will have correspondingly fewer related onshore impacts to cultural resources. However, expected regional impacts are still low. Localized low to moderate impacts may occur.

2) Impacts of Special Concern

a) Coastal Ecosystems

(1) Intertidal: The impact agents to intertidal communities are oil spills and pipelines. A discussion of these agents and their impacts is given in Section V.D.8.a.2)a)(1). The number of 1,000 bbl or greater spills will be reduced by 1.2 spills (1.95 to 0.79) and the number of 10,000 bbl or greater spills will be reduced by 0.6 (1.0 to 0.4) if this alternative is adopted rather than the proposal.

The impacts on intertidal areas will be less than those discussed in Alternative I-1. Impacts from spills should be low rather than low to moderate. The likelihood of these impacts occurring is reduced from moderate to low to moderate because of fewer expected spills. Impacts from pipelines should remain low and the likelihood of such an impact should also remain moderate.

Conclusions. Impacts associated with the adoption of Alternative III-1 on intertidal communities should be low rather than low to moderate as discussed for Alternative I-1. The likelihood of impacts from oil spills should be reduced from moderate to low to moderate.

(2) Subtidal Benthos: The impact agents to subtidal benthic communities are platforms and associated drilling muds and cuttings, oil spills and pipelines. A discussion of these agents and their impacts is given in Section V.D.8.a.2)a)(2). There will be a 11 fewer platforms (19 to 8) if this alternative is adopted rather than the proposal. The number of 1,000 bbl or greater spills will be 1.2 spills fewer (1.95 to 0.79) and the number of 10,000 bbl or greater spills 0.6 fewer (1.0 to 0.4) if this alternative is adopted.

There may be a decrease in the likelihood from moderate to low of a high ecological loss to entire hard bottom benthic areas as the result of the reduced platforms because the decreased chance of locating several platforms on the same reef or areally limited hard bottom habitat. The platform-induced impacts to other benthic habitats will remain the same as discussed for Alternative I (e.g., low for the general surrounding area, but moderate to high in the immediate vicinity of the platforms). The likelihood of

these impacts on hard bottoms should be low rather than the moderate likelihood predicted for Alternative I-1, but the likelihood for soft bottoms will remain high.

The likelihood of multiple spills impacting the same location and resulting moderate to high impacts (hard bottoms) is low. All other impacts, both with respect to level and likelihood, to the subtidal benthos will remain the same as those discussed for Alternative I-1. Although high impacts on hard bottoms are possible, impacts on both hard and soft bottoms will typically be low, and the likelihood will be high. Pipelines will still cause low impacts on soft bottoms and moderate to high impacts on hard bottoms with the likelihood of such impacts to occur being high.

Overall, the expected regional impacts on subtidal benthos are low. This is a reduction from the low to moderate prediction of Alternative I-1 and is due to the reduced likelihood of the presence of multiple platforms on a reef or limited hard bottom.

Conclusions. Impacts associated with the adoption of Alternative III-1 on subtidal benthic communities should be the same as those discussed for Alternative I-1. The likelihood of impacts resulting from multiple platforms on the same hard bottom habitat or reef should be low rather than moderate as predicted for the proposal. The likelihood of multiple spills impacting the same location should be low rather than high. Overall, expected regional impacts on subtidal benthos are low.

(3) Estuaries, Marshes, Wetlands: The impact agents to estuaries and wetlands are oil spills and onshore construction. A discussion of these agents and their impacts is given in Section V.D.8.a.2)a)(3). The expected number of 1,000 bbl or greater spills is 1.2 spills fewer than the proposal (1.95 to 0.79) and the expected number of 10,000 bbl or greater spills is 0.6 fewer (1.0 to 0.4) if this alternative is adopted.

The impacts on estuaries will be the same (high to very high) as those discussed for Alternative I-1. However, the likelihood of this occurrence is reduced from moderate to low to moderate because of the decrease in number of expected spills. The impacts on estuaries caused by onshore construction will remain the same both in terms of scope (high) and likelihood (very low) as discussed for Alternative I-1.

Conclusions. Impacts associated with the adoption of Alternative III-1 on estuaries and wetlands should be the same as those discussed for Alternative I-1. The likelihood of impacts from oil spills should be low to moderate rather than moderate as predicted for the proposal. Overall, the expected regional impacts on estuaries and wetlands are low to moderate. This is the same regional impact as predicted in Alternative I-1.

b) Commercial Fisheries

(1) Fish: The expected numbers of oil spills associated with this alternative are 0.8 oil spills greater than 1,000 bbl and 0.4 oil spills greater than 10,000 bbl. This is less than one-half the number of oil spills expected to result from Alternative I-1. Since surface fish populations (e.g., Pacific herring, northern anchovy) are expected to be impacted each time there is a major oil spill, adoption of this alternative would result in surface fish populations being impacted about half as often as adoption of Alternative I-1. Nevertheless, surface fishes are still expected to sustain low to moderate ecological losses each time there is a major oil spill. Fewer oil spills also would result in a lower likelihood that salmon and other anadromous fishes would sustain high ecological losses from oil spills. Under Alternative I-1, the likelihood of these impacts is expected to be low to moderate. Under of Alternative III-1, this likelihood is expected to be low.

Adoption of this alternative also would result in less than one-half the number of wells and platforms expected to result from Alternative I-1 and therefore, the amount of man-made structures and drilling muds. However, the impacts of man-made structures and drilling muds on fish populations are unknown. Therefore, the changes in impacts from man-made structures and drilling muds if this alternative is adopted are unknown.

Overall, adoption of this alternative is expected to have the same regional impacts on fish as Alternative I-1 since it is still likely that a few localized species will be impacted but most fish species will not be impacted.

Conclusions. Adoption of this alternative would result in surface fishes (e.g., Pacific herring, northern anchovy) being impacted at the same level as adoption of Alternative I-1. Locally, these populations are still expected to sustain short-term low to moderate ecological losses. Adoption of this alternative also would result in a lower likelihood (low) that salmon and other anadromous fishes would sustain high ecological losses. Overall, adoption of this alternative is expected to have the same regional impacts (low) on fish as Alternative I-1.

(2) Commercial Fisheries: The expected numbers of oil spills associated with this alternative are 0.8 oil spills greater than 1,000 bbl and 0.4 oil spills greater than 10,000 bbl. This is less than one-half the number of oil spills expected to result from Alternative I-1. Fewer oil spills associated with this alternative than the proposal would result in a lower likelihood that a large oil spill would occur in prime fishing grounds and, therefore, that commercial fisheries would sustain short-term moderate to high economic losses. Adoption of this alternative also would result in a lower likelihood (low) that salmon fisheries would be impacted. However, since 0.8 oil spills greater than 1,000 bbl are expected from this alternative, commercial fisheries are still expected to sustain short-term moderate to high economic losses and salmon fisheries may sustain low to moderate impacts for 5 years or more.

Adoption of this alternative also would result in 8 platforms. This is less than one-half the number of platforms expected to result from Alternative I-1. The lower number of platforms associated with this alternative would result in a lower likelihood that several platforms would be placed within prime trawling grounds, and, therefore, that the commercial trawl fishing industry would experience low to moderate economic losses due to preclusion of fishing space. However, since eight platforms are expected from this proposal, there still is a low probability that the losses described above would occur.

The number and length of pipelines that will result from the proposal are unknown. However, since adoption of this alternative would result in about half the number of platforms expected to result from Alternative I-1, this alternative probably would result in half the number of pipelines. The refore, adoption of this alternative would result in a lower likelihood that pipelines would be placed in important fishing areas, and, therefore, that the commercial trawl fishing industry would experience moderate to high economic impacts. However, there still is a low probability that these losses would occur from this alternative.

Other impacts on commercial fisheries are not expected to be significantly different from Alternative I-1. Overall, adoption of this alternative is expected to have the same regional impacts on the commercial fishing industry as Alternative I-1 since it is still likely that some but not all commercial fisheries will be impacted.

Conclusions. Overall, adoption of this alternative is expected to have the same regional impacts (moderate) on the commercial fishing industry as Alternative I-1.

c) Endangered and Threatened Species

(1) Endangered Species: The number of spills predicted from the Central and Northern California OCS activities under Alternative III-1 are 0.8 spills greater than 1,000 bbl and 0.4 spills greater than 10,000 bbl a little less than half those expected under Alternative I-1. Platform numbers are also less than half (19 vs 8).

Impact agents and resources are the same as in Alternative I-1. The effect of oil spills and platforms on the various species will remain the same, only the probability of an impact from an oil spill is less. The smaller number of platforms and related OCS activities is not consider significant in reducing potential noise and disruption impacts. Drill effluent impacts remain uncertain.

The most probable impacts to endangered species, if hit by an oil spill, are the same as in Alternative I-1. Of the species potentially impacted, the impact levels predicted are as follows: brown pelican - low to moderate, sea turtles - low, great whales - low to moderate, and, least terns and California clapper rails - high.

The estimated likelihood of these impacts occurring is reduced one likelihood category due to the small numbers of expected spills. The likelihood of the above impacts on the endangered species is as follows: brown pelican -very low, sea turtles - very low, great whales - moderate, and California clapper rails and least terns - very low. Overall, the expected regional impacts are low. High impacts are not likely to occur. For a more detailed discussion of impact levels and agents to endangered species, see Section V.D.8.a. 2)c)(1).

Exploration and development under Alternative III1 will proceed more slowly than under Alternative I-1. For almost all marine, endangered and threatened species, the level of information currently available is very low. Basic physiology and behavior is just beginning to be studied in relationship to oil toxicity, effects of drilling effluents and noise, contact effects of oil and the effects on food sources of OCS oil activities. The slower development schedule proposed under Alternative III-1 potentially allows research to be carried out over the life of resource development to more nearly determine the biology of marine animals and propose actions which may mitigate (reduce) impacts.

Conclusions. The impact levels for endangered species are the same for Alternatives III-1 and I-1. Overall, the expected regional impacts are low to moderate.

(2) Threatened Species: See the above section for the estimated number of spills and platforms. Sea otters are the only federally listed threatened species. The most likely level of impact to sea otters should a spill contact a colony is high due to the adverse effects of oiling. For a discussion of impact agents and level to the southern sea otter, see Section V.D.8.a.2)c)(2). The likelihood of this occurring is slightly less under Alternative III-1 than I-1 due to the 40 percent fewer predicted spills but remains moderate due to the broad area occupied by the population.

The overall expected regional or population imports are moderate since it is unlikely that more than a portion of one colony should be affected.

See the preceding section for a discussion of the potential advantages afforded by the slower development schedule expected in Alternative III-1.

Conclusions. Overall, the expected regional impacts to threatened species are moderate.

d) Habitats and Resources of Special Concern

(1) Marine and Estuarine Sanctuaries: The impact agents to the Point Reyes/Farallon Islands National Marine Sanctuary are oil spills and platforms. A discussion of these agents and their impacts is given in Sections V.D.8.a.2)d)(1), V.D.8.a.2)d)(3) and V.D.8.a.2)d)(4). There will be 11 fewer platforms (19 to 8) if this alternative is adopted rather than the proposal. The number of 1,000 bbls or greater spills will be 1.2 spills fewer (1.95 to 0.79) and the number of 10,000 bbls or greater spills will be reduced by 0.6 fewer (1.0 to 0.4) if this alternative is adopted.

The impacts on the marine sanctuary will be the same as those discussed for Alternative I-1. The principal concern for the Point Reyes/Farallon Islands National Marine Sanctuary is for seabirds and pinnipeds. The impacts to these organisms remains low to moderate from oil spills and platforms. The likelihood of these impacts will be somewhat lower than for the proposal, but will remain low.

Conclusions. Impacts and their likelihood associated with the adoption of Alternative III-1 on the Point Reyes/Farallon Islands National Marine Sanctuary should be the same as those discussed for Alternative I-1.

Overall, the expected regional impacts on the Point Reyes/Farallon Islands National Marine Sanctuary are low. This is the same as predicted for Alternative I-1.

(2) Designated Areas of Special Concern: The impact agents to intertidal and shallow subtidal communities with the designated areas of special concern are oil spills and pipelines. A discussion of these agents and their impacts is given in Sections V.D.8.a.2)a)(1), V.D.8.a.2)a)(2), V.D.8.a.2)d)(2).

The expected number of 1,000 bbl or greater spills is 1.2 spills fewer than the proposal (1.95 to 0.79) and the number of 10,000 bbl or greater spills is 0.6 fewer (1.0 to 0.4) if this alternative is adopted.

The impacts on intertidal shallow subtidal benthos and sea otters will remain the same as those discussed in Alternative I-1. Impacts from spills should remain low to moderate, except for shallow water benthic and intertidal communities and high for the sea otter population. The likelihood of these impacts should be reduced from high to moderate because of the reduced number of expected spills. Impacts from pipelines on the designated special areas are not expected to occur because of the high degree of concern placed upon them by the State of California.

Conclusions. Impacts associated with the adoption of Alternative III-1 on designated areas of special concern should be the same as those discussed for Alternative I-1. The likelihood of impacts from oil spills should be reduced from high to moderate. Overall, the expected regional impacts on designated areas of special concern are moderate. This is the same as predicted in Alternative I-1.

(3) Marine Mammals: The number of spills predicted from the Central and Northern California OCS activities under Alternative III-1 are 0.8 spills greater than 1,000 bbl and 0.4 greater than 10,000 bbl, a little less than half those expected under Alternative I-1. The expected number of platforms is also less than half (19 versus 8).

Impact agents and marine mammal species are essentially the same as in Alternative I-1. The effects of oil spills and platforms on the various species will remain the same; only the probability of an import from an oil spill is less. The fewer platforms and less related OCS activities than expected for the proposal is not considered significant in reducing potential noise and disruption impacts. Drill effluent impacts remain uncertain.

Due to impact agents and species being essentially the same, the level of impacts to marine mammal species is the same for Alternatives III-1 and I-1. The likelihood of impacts is slightly less due to the lower oil reserve estimates. Impacts to cetaceans are low to moderate for both alternatives, the likelihood is low, slightly less than the low to moderate likelihood expected for Alternative I-1. Breeding pinnipeds may experience moderate impacts under both alternatives, the likelihood under III-1 is slightly less (very low versus low). Nonbreeding pinnipeds have a low level and likelihood for both alternatives. Overall, the expected regional impacts are low. Due to the location of most breeding pinnipeds and the few spills predicted, impacts are not expected. See Section V.D.8.a.2)d)(3) for more details on species, impact levels and agents.

Exploration and development under Alternative III-1 will proceed more slowly than under Alternative I-1. For biological resources, the more moderate development rate is preferable. For almost all marine, endangered and threatened species, the level of information currently available is very low. Basic physiology and behavior is just beginning to be studied in relationship to oil toxicity, effects of drilling effluents and noise, contact effects of oil and the effects on food sources of OCS oil activities.

The slower development schedule proposed under Alternative III-1 will potentially allow research to be carried out to more nearly determine the biology of marine animals and propose actions which may mitigate (reduce) impacts. In this sense, the slower rate of development proposed under Alternative III-1 may be highly favorable to the continued health and survival of the marine mammals discussed above.

Conclusions. Impact levels are the same for Alternative I-1 and III-1. The likelihood of impacts is slightly reduced. Overall, the expected regional impacts are low.

(4) Seabirds: The number of spills predicted from the Central and Northern California OCS activities under Alternative III-1 are, 0.8 spills greater than 1,000 bbl and 0.4 greater than 10,000 bbl, a little less than half those expected under Alternative I-1. The number of platforms is also less than half (19 versus 8).

Impact agents and resources are the same as in Alternative I-1. The effects of oil spills and platforms on the various species will remain the same, only the probability of an impact from an oil spill is less. The smaller number of platforms and related OCS activities is not considered significant in reducing potential noise and disruption impacts. Drill effluent impacts remain uncertain.

Due to the same impact agents and species or resources which are effectively the same, impact levels are the same for Alternatives I-1 and III-1. The likelihood categories are reduced. Therefore, possible impacts to nesting species are moderate to high and low to moderate for non-nesting seabirds. The levels are somewhat lower for Alternative III-1 versus I-1; very low versus low for nesters and moderate versus high for non-nesters. Overall, the expected regional impacts are expected to be low.

See the previous section, Marine Mammals, for a discussion of the possible advantages of the slower schedule expected for Alternative III-1 compared to I-1. The advantages to seabirds would be the same.

Conclusions. Impact levels for seabirds are the same for Alternative III-1 and I-1. The likelihoods are reduced one category. Overall, the expected regional impacts are low.

e) Air Quality: Under this alternative it is estimated that 38 exploratory wells are required to describe the resources and 191 development/production wells and 8 platforms to develop the resources. This is significantly fewer than are expected for the proposal. However, because the platforms are expected to be located in the same general areas as the proposal and no new refineries or gas processing facilities are anticipated, the impact is expected to be low. The siting of a gas processing facility would raise the level of expected impact to moderate.

Conclusions. The level of expected impact from OCS oil and gas activities on air quality is low, as it is for Alternative I-1.

f) Recreation and Tourism

(1) Coastal Recreation: The adoption of this alternative will result in fewer anticipated oil spills than Alternative I-1: 0.8 spills greater than 1,000 barrels and 0.4 spills greater than 10,000 barrels. This is less than half those expected for Alternative I-1. This will result in a low likelihood of impact; however, any impact that does occur will have the same effect as those stated for Alternative I-1 (Section V.D.8.a.2)f)(1)).

The number of platforms associated with this alternative is eight, which is less than half those expected for Alternative I-1. The likelihood of impact, therefore, will be reduced to very low as these platforms will be spread out over the length of the coastline in the areas of favorable geologic conditions. The impact of the platforms will remain as stated for Alternative I-1.

Conclusions. The likelihood of an impact occurring for this alternative is low, and the localized impact, if the impacts occur, will remain high as stated for Alternative I-1. Overall, the expected regional impacts are moderate.

(2) Visual Resources: The adoption of this alternative results in fewer anticipated oil spills than Alternative I-1: 0.8 spills greater than 1,000 barrels and 0.4 spills greater than 10,000 barrels. This is less than half the number expected for Alternative I-1. This will result in a low likelihood of impact; however, any impact that does occur will have the same effect on visual resources as stated for Alternative I-1 (Section V.D.8.a.2)f)(2)).

The 8 platforms associated with this alternative is over 50 percent less than the expected 19 platforms resulting from Alternative I-1. The likelihood of impact will be reduced to low, as the possibility of a specific area being affected is reduced. The impact of a platform will remain as stated for Alternative I-1.

Conclusions. The likelihood of an impact occurring for this alternative is low, and the localized impact, if the impact occurs, will remain high as stated for Alternative I-1. Overall, the expected regional impacts are moderate.

g) Socio-Economic Factors: The impact agents for this alternative are the same as those described in Section V.D.8.a.2)g).

(1) Employment: Employment increases from this alternative are expected to be 3,600 jobs, or 44 percent of the change associated with Alternative I-1. The change in employment resulting from this alternative should result in no change in the economic structure of the region.

Conclusions. Impacts from this alternative are very low, the same as those associated with Alternative I-1.

(2) Population and Demography: The increase in population from this alternative is 45 percent of the change associated with Alternative I-1. The expected increase of 7,400 people in the region should result in no significant impacts as a result of this alternative.

Conclusions. The impact from this alternative is very low, the same as that for Alternative I-1.

(3) Public Services and Facilities: The change in economic activity and population growth resulting from this alternative will result in a lower level of impacts on public services and facilities than the proposal. The demand associated with this alternative should result in no significant impacts on public facilities and services except for water supply (see Section V.D.8.d.1)a)(2)).

Conclusions. The expected impacts are as stated for Alternative I-1, very low.

THE MORE SIGNIFICANT ENVIRONMENTAL CONSEQUENCES

Central and Northern California Resource Category	Level of Expected Impacts[1/] Scheduled Sales Only Under Alternative III-1	Cumulative Impacts of All Activities
1. General Impacts		
a. Water Quality and Supply		
Water Quality	low	moderate
Water Supply	low[2/]	high
b. Navigation		
Ports and Harbors	moderate[2/]	high
Marine Traffic	low	moderate
c. Other Uses of the OCS		
Ocean Dumping	very low	very low
Military	low	low
Offshore Oil and Gas Infrastructure	n/a	n/a
d. Land Use (OCS-related Infrastructure)	very low	moderate
e. Cultural Resources		
Offshore	low	low to moderate
Onshore	low	moderate
2. Impacts of Special Concern		
a. Coastal Ecosystems		
Intertidal	low[2/]	moderate
Subtidal Benthos	low[2/]	moderate to high
Wetlands	low to moderate	moderate
b. Commercial Fisheries		
Fish	low	high
Fisheries	moderate	high
c. Endangered & Threatened Species		
Endangered Species	low to moderate	very high
Threatened Species	moderate	moderate to high
d. Habitats and Resources of Special Concern		
Marine & Estuarine Sanctuaries	low	moderate
Designated Areas of Special Concern	moderate	moderate
Marine Mammals	low	low to moderate
Seabirds	low	low to moderate
e. Air Quality	low	moderate
f. Recreation & Tourism		
Coastal Recreation	moderate	moderate
Visual Resources	moderate	moderate
g. Socioeconomic Factors		
Employment	very low	high
Population & Demography	very low	moderate
Public Service & Facilities	very low	moderate

[1/] Definitions of level of impact are located in the beginning of V.D.

[2/] Differs from the proposal.

3) Impacts on Other Management Plans: Impacts are as described in Section V.D.8.a.3).

4) Unavoidable Adverse Impacts: Impacts are as described in Section V.D.8.a.4).

5) Relationship Between Short-Term Uses of Man's Environment and Long-Term Productivity: Relationships are as described in Section V.D.8.a.5).

6) Irreversible and Irretrievable Commitment of Resources: Commitment of resources are described in Section V.D.8.a.6).

e. Alternative III-2: Current (June 1980) Schedule - Offering Greater Acreage per Sale

The level of expected impacts following the implementation of Alternative III-2 does not significantly differ from those discussed in Alternative III-1. The estimated hydrocarbon resources for Alternative III-2 in Central and Northern California are as follows: 0.26 billion barrels oil and 0.36 trillion cubic feet gas. Infrastructure expected to be used to explore and develop these resources includes 48 exploratory wells, development/production wells, and 10 platforms. The predicted oil resources and infrastructure for this alternative are approximately one-half less than those predicted for Alternative I. It is expected that 1.1 oil spills greater than 1,000 bbl and 0.6 oil spills greater than 10,000 bbl will occur following the implementation of Alternative III-2. Again, reductions in predicted oil spills are about 45 percent less than those described for Alternative I. Predicted resources, infrastructure, and oil spills for Alternative III-2 are about one-fourth to one-third higher than those predicted for Alternative III-1. Although the resources, infrastructure and oil spills are higher in Alternative III-2, significant differences in impacts cannot be differentiated from those described in Alternative III-1.

f. Alternative IV-1.a: Delete 7 Alaska Sales, Change the Timing of Others Using Area-wide Offerings.

The impacts from this alternative in Central and Northern California are identical to those described for Alternative I-1.

g. Alternative IV-1.b: Delete 7 Alaska Sales, Change the Timing of Others Offering Favorable Geological Acreage.

The impacts from this alternative in Central and Northern California are identical to those described in Alternative I-1.

h. Alternative IV-2.a: Delete All Arctic Planning Areas From the Schedule While Using Planning Area-wide Offerings.

The impacts from this alternative in Central and Northern California are identical to those described in Alternative I-1.

THE MORE SIGNIFICANT ENVIRONMENTAL CONSEQUENCES

Central and Northern California Resource Category	Level of Expected Impacts[1/] Scheduled Sales Only Under Alternative III-2	Cumulative Impacts of All Activities
1. General Impacts		
a. Water Quality and Supply		
Water Quality	low	moderate
Water Supply	low[2/]	high
b. Navigation		
Ports and Harbors	moderate[2/]	high
Marine Traffic	low	moderate
c. Other Uses of the OCS		
Ocean Dumping	very low	very low
Military	low	low
Offshore Oil and Gas Infrastructure	n/a	n/a
d. Land Use (OCS-related Infrastructure)	very low	moderate
e. Cultural Resources		
Offshore	low	low to moderate
Onshore	low	moderate
2. Impacts of Special Concern		
a. Coastal Ecosystems		
Intertidal	low[2/]	moderate
Subtidal Benthos	low[2/]	moderate to high
Wetlands	low to moderate	moderate
b. Commercial Fisheries		
Fish	low	high
Fisheries	moderate	high
c. Endangered & Threatened Species		
Endangered Species	low to moderate	very high
Threatened Species	moderate	moderate to high
d. Habitats and Resources of Special Concern		
Marine & Estuarine Sanctuaries	low	moderate
Designated Areas of Special Concern	moderate	moderate
Marine Mammals	low	low to moderate
Seabirds	low	low to moderate
e. Air Quality	low	moderate
f. Recreation & Tourism		
Coastal Recreation	moderate	moderate
Visual Resources	moderate	moderate
g. Socioeconomic Factors		
Employment	very low	high
Population & Demography	very low	moderate
Public Service & Facilities	very low	moderate

1/ Definitions of level of impact are located in the beginning of V.D.

2/ Differs from the proposal.

i. Alternative IV-2.b: Delete All Arctic Planning Areas From the Schedule While Offering Favorable Geological Acreage.

The impacts from this alternative in Central and Northern California are identical to those described in Alternative I-1.

9. Gulf of Alaska

a. Alternative I-1

1) General Impacts

a) Coastal Ecosystems: Leasing in the Gulf of Alaska may affect critical breeding and feeding areas for birds and marine mammals, as well as unique and highly productive areas for other marine life. Prince William Sound is such an area. Millions of sea birds nest in colonies along the sound's rocky coast, on adjacent Hinchinbrook and Hawkins Islands and Middleton Island further offshore, and also feed in marine waters offshore. Large seal and sea lion rookeries and pupping grounds are present within the approaches to the sound, and the Middleton Island area. Also, large numbers of sea otters, fur seals, dolphins, and whales occur seasonally in the sound. Oil contamination in the sound could have adverse impacts on many species and great numbers of wildlife. Oil and gas activities such as air traffic in the general area could also have adverse affects.

Coastal wetlands such as the Copper and Bering River deltas are critical breeding and feeding habitat for millions of ducks, geese, swans, shorebirds, and large concentrations of seals and other wildlife that could be adversely impacted by oil and gas development in the area. Waterfowl (ducks, geese, swans) would be particularly vulnerable to oil pollution in or near their wetlands. Other important critical areas for birds and marine mammals include the Yakutat Bay area and Icy Bay. The major Pacific flyway for millions of migratory birds and the migratory routes of seven endangered whale species transect the proposed Gulf of Alaska oil and gas lease area. Oil pollution and air traffic support activities could directly impact these important populations.

For all fish species, the most sensitive areas are where larval and juvenile forms feed. For most fish species in Alaskan saltwaters, this is the area shoreward from about the 20 meter depth. For salmon, specifically, it is the intertidal, brackish/freshwater line onshore. Larval-juvenile forms are more sensitive to water-soluble fractions of oil, to habitat disturbance, and to chronic low levels of pollutants. Salmon, king, tanner, and dungeness crab, shrimp, halibut, herring, and the many inshore and intertidal forage fish species are the major users of this critical habitat. In the Gulf of Alaska, Prince William Sound and Yakutat Bay are the major areas of use by these organisms.

Severity of impacts from whatever source would depend on the time of year a disturbance takes place, the type of event (pollution or habitat disturbance), and the major fish species present. The best estimate of impact would be that at some time in the life of this proposal, some fish population from a limited area will be reduced to a point that recovery will take three or more years.

If the impacting agent is severe enough, covers a large area, and hits during the peak abundance months (June and July), many species could be affected.

Recovery rates would likely vary between 2-7 years. Pollutant events would be the major source of these impacts.

Refer to the Gulf of Alaska impact analysis on birds, fish, and habitats and resources of special concern (Sec.V.D.9.a.2)a) through c) for more detailed discussions of the topics covered in this section.

Conclusion. Overall, the effects of oil and gas development on the coastal ecosystems of this planning area is expected to be low. It is possible that an oilspill could contact haulout grounds for seals and sea lions, rocky beaches and coastal wetlands inhabitated by many species of waterfowl and other birds, and shallow, nearshore waters inhabited by larval and juvenile finfish and shellfish. Aircraft and marine vessel noise could affect waterfowl and other birds.

Cumulative Impacts. If all areas of the Gulf of Alaska planning area are leased and all resources subsequently developed over the life of the proposal, the expected number of oilspills is 3.9 spills greater than 1,000 barrels and 1.7 spills greater than 10,000 barrels. An additional, unknown number of spills are expected to result from tankering of Arctic oil from Port of Valdez through the Gulf of Alaska planning area. Additional projects or activities that could contribute to cumulative impacts in the planning area are, commercial fishing activities and other vessel traffic. These total projects or activities could affect coastal ecosystems by substantially increasing the risk of oilspills and disturbance. The cumulative impacts of these oilspill events, projects and activities are expected to produce a moderate to high impact to these coastal ecosystems.

In relation the event all resources in the planning area were leased and developed, the alternative contributes about 15 percent of spills greater than 1,000 barrels and about 12 percent of spills greater than 10,000 barrels. These proportions are over shadowed when the tankering from other Federal OCS planning areas and State lease sale areas (to an unknown extent) are considered. The most important causal agent for potential cumulative impacts on coastal ecosystems is tankering of oil from the Port of Valdez. The contribution of the alternative to cumulative impacts is insignificant in either the case of only the resources described in the proposal or all resources leased and developed in the planning area.

b) Water Quality and Supply

Water Quality: Because of low population and lack of industry in the Gulf of Alaska planning area, onshore water quality is very high. Impact of offshore oil and gas development on onshore water quality would result from construction of shore facilities and greater sewage loads. Increased and more turbid runoff caused by construction activities would be very local and short term. Increased requirements for sewage treatment would be met by upgrading existing community treatment plants and/or construction of industry-maintained facilities. Overall impact of the proposed leasing schedule on onshore water quality would be low, locally, impacts could be moderate.

Present water quality is nearly pristine in the Gulf of Alaska. Treated sewage and fish processing wastes from gulf communities are discharged into local marine waters and appear to cause minimal, if any, adverse effect on water quality. Offshore water quality would be impacted by discharge of drilling muds, drill cuttings, formation waters, and accidental discharges of oil. If expected quantities of gas and oil are found, 107 million barrels of formation

waters would be produced over the life of the field. Only 0.6 oilspills of 1,000 barrels or greater would be expected. Probability of a major oilspill is also remote - only 0.2 spills of 10,000 barrels or more are predicted if commercial quantities of oil are found. During the years of exploratory and developmental drilling, an annual average of 9,900 cubic yards of drill cuttings and 31,000 barrels of drilling mud would be discharged into the gulf. The discharge of mud and cuttings would increase turbidity around drilling sites, affecting 0.006 percent of the area of the planning unit. If formation waters are discharged rather than reinjected into the reservoir, they could put an equivalent of 26,000 barrels of oil into the Gulf of Alaska waters. Excluding the occurrence of a major oilspill, offshore petroleum development would result in moderate local degradation of water quality in the vicinity of drill rigs.

Conclusion. The effects of oil and gas development in the planning area on water quality would be low, except possibly in the immediate vicinity of platforms. Water supply systems have not been extensively developed on adjacent land areas, and such development would have to take place. Impacts on water supply is expected to be high in the Yakutat area.

Cumulative Impacts. In the event that all potential oil and gas resources of the Gulf of Alaska planning area are leased and subsequently developed in a timely manner, the expected number of oilspills is 3.9 spills of 1,000 barrels or more, with 1.7 spills of at least 10,000 barrels. An additional unknown quantity of oilspills is expected to result from tankering from Federal OCS lease sales in Cook Inlet, Eastern Gulf of Alaska, and Diapir Field planning areas, and from development of State of Alaska onshore and offshore reserves in Cook Inlet. Oil industry development of all gas and oil reserves in the Gulf of Alaska planning area would result in discharge of 63,000 cubic yards of drill cuttings and 200,000 barrels of drilling mud during drilling phases only. Formation waters produced would total 663 million barrels over the life of the field. Increases in commercial traffic could also contribute to cumulative impacts in the planning area. This traffic would pose an additional but unknown risk of fuel spills. The cumulative impacts of these oilspill events, discharges, and additional traffic are expected to produce a moderate impact to water quality in the planning area.

In relation to the case of all resources in the planning area leased and developed, the Gulf of Alaska planning area in this alternative contributes 15 percent of spills of 1,000 barrels or more and 12 percent of spills of at least 10,000 barrels. The Gulf of Alaska planning area in this alternative would provide 30 percent of cumulative impact to the planning area from drill cuttings, 17 percent of the impact from drilling mud, and 25 percent of the impact from formation waters. The greatest threat to Gulf of Alaska water quality is from oil pollution caused by tankering.

The percentage of cumulative impact from oil pollution due to development within the Gulf of Alaska planning area portion of the alternative is even less when tankering from other Federal OCS planning areas, the Valdez pipeline terminal, and proposed and existing state leasing are considered. The Gulf of Alaska planning area in this alternative contributes negligibly to the total cumulative planning area case. The most important causal agent for potential cumulative impact on water quality is spillage during tankering of oil from

Valdez. The contribution this alternative to planning area cumulative impacts is negligible.

If all potential oil and gas resources of the Gulf of Alaska planning area were leased and developed, new water supply facilities would be required, causing very high impact. Other cumulative impacts are expected from existing Federal OCS leasing, and general development of the area. The sum effect of thes additional impacts is likely to be high. It is unknown whether the proposed action in this planning unit under this alternative would constitute a major portion of total water supply needs. The contribution of the proposal to cumulative impacts on water supply is significant if the South Alaska resources are all located in the planning area. In light of total development of hydrocarbons in South Alaska, if all hydrocarbons occur and are developed within the Gulf of Alaska, the proposal is not a significant contributor to the overall cumulative impacts in the region.

c) Navigation: Fishing activities within the entire Gulf of Alaska can be heavy locally, especially off Kodiak Island, which is outside this planning area. Tanker traffic exiting Prince William Sound is relatively heavy. However, given the large size of the gulf, the level of vessel activity us be considered as low. The proposed action calls for the emplacement of one production platform. The level of marine vessel traffic associated with this proposal would cause very low impact on navigation. Increased tankering is expected to result from sales in the Diapir Field. This crude will be tankered from Valdez. A limited traffic separation zone controls traffic through the narrows. Impacts are expected to be moderate.

Conclusion. Impact on navigation is expected to be moderate. This is primarily due to increased tankering from Valdez.

Cumulative Impacts Currently there are no state oil and gas lease sales scheduled for the Gulf of Alaska. Should exploratory activities for Lease Sale 55 as well as pending Lease Sale 100 prove successful, the Port of Yakutat could receive significant impacts. Judging from past experience, it is probable that industry will continue to use (and expand) its present facility at Monti Bay. Although industry's use of private facilities would tend to alleviate the potential for vessel and space conflicts, it is to be noted that Monti Bay is rather small and Yakutat's weather is usually inclement. These factors, coupled with Yakutat's antiquated public docking facility at Monti Bay, indicate a potential for conflict. Renovation of the public facility would alleviate but not eliminate potential conflicts.

Current vessel traffic issuing from Yakutat is almost entirely made up of the fishing fleet. Little growth is projected for the local fishing fleet. OCS traffic in the future is expected to constitute 10-15 percent of all daily trips. In regard to the impact of this proposal on the navigability of waters around Yakutat, it must be considered moderate, with the potential for high impacts within the narrow confines of Monti Bay.

Increased tankering of crude out of Prince William Sound is anticipated to result from the proposal. This is primarily due to the fact that development in the Diapir Field planning area will be transported to Valdez via TAPS and tankered to refineries and markets outside Alaska (south). This entails approximately 1.66 billion barrels of crude under the proposal (or 277 billion

barrels if all the resources in the planning area are leased and developed). Additional tankering from Valdez will carry North Slope production as well as from other onshore State and Federal leases. As a result of increased vessel traffic, moderate impacts will occur to navigation in the area. The proposal is a moderate contributor to this both in the case of development of the resources described in the proposal and with development of all resources in the planning areas (Gulf of Alaska and Diapir).

d) Other Uses of the OCS: Other uses in the Gulf of Alaska are mainly fishing activities with some recreation. The gulf is used for marine transport covered above. None of the other uses should be appreciably impacted by the proposal. Impacts on fishing and recreation are discussed in the relevant sections, below.

e) Land Use: With the exception of Yakutat, the entire coastline along the Gulf of Alaska is virtually undeveloped. Most of the area is in preserve status or National Forest. Development activities along the coast may not be consistent with the intent of the preserves.

Because it has the only large-scale infrastructure adjacent to the lease area and the expected location of the resources in the eastern gulf, Yakutat would receive most of the impacts as discussed above from OCS activities conducted in the Gulf of Alaska planning area. These include a medium-size crude oil terminal with docking facilities, tanker traffic, and an expanded support and supply base. Enclaved development chould reduce the local land use impacts and the competition for goods and services to a great extent, but such development is not guaranteed. There would be some impacts, because the area outside the city proper is essentially undeveloped. Oil and gas development associated with the proposal is expected to result in dedication of 150 acres to a functional support facilities and/or processing terminal. Much of the land has already been changed to this use by industry expectations associated with past sales. Impacts are expected to be low.

Conclusion. Impacts on land use are expected to be low, as most of the area is undeveloped and could easily accommodate additional land development. Yakutat would be affected if it is used as a supply base and storage area and is expected to incur low impacts.

Cumulative Impacts. Other projects that will affect land use in the Yakutat area are the improvement of the Yakutat City dock, the development of Yakutat-Kwan lands, and implementation of the municipal comprehensive land use plan. These should affect land use in that private land use patterns will become subject to close Native Corporation and municipal scrutiny.

For the total OCS development scenario, land use impacts would affect 450 acres of land because of the need for a very large oil and/or gas processing facility, attendant docking facilities, warehouses, living quarters, and a complete material support facility. The maximum resource development would result in very significant changes in land use. Much of the land around Yakutat would be used for oil and gas industry activities. The town would undergo rapid expansion and the south side of Yakutat Bay would change from a rural fishing village to a relatively urban industrial town. Therefore, cumulative impacts to land use are moderate.

The proposal, should resource development be serviced from Yakutat, is a major contribution to land use impacts with or without full development of the resources.

f) Cultural Resources: Construction activities, oiling (from potential oilspills), and salvage archaeology could damage or destroy cultural resources. It is unlikely, however, that industry would encounter cultural resources in the course of developing the resources of this planning area due to the low level of expected development.

Conclusion. Impacts on cultural resources would be low, as the likelihood is small that any such resources would be encountered by the oil and gas industry.

Cumulative Impacts. In the event that all potential oil and gas resources of the Gulf of Alaska planning area are leased and all resources subsequently are developed over the life of the field, the expected number oilspills is 3.9 spills greater than 1,000 barrels and 1.7 spills greater than 10,000 barrels. An additional unknown quantity of oilspills is expected to result from tankering from Federal OCS development in the Cook Inlet and Kodiak planning areas. Additional projects or activities which may contribute to cumulative impacts in the planning area are Valdez tankering, gold mining and coal ships. These total projects or activities could effect cultural resources in the following ways, population impacts, (such as looting), and oiling of artifacts. The cumulative impacts of these oilspill events, projects and activities are expected to produce a moderate impact to cultural resources in the Gulf of Alaska planning area.

Compared to the unlikely case of all resources in the planning area leased and developed, the alternative contributes 15 percent of spills greater that 1,000 barrels and 12 percent of spills greater than 10,000 barrels. These proportions are overshadowed greatly when the tankering from other Federal OCS planning areas and State lease sale areas (to an unknown extent) are considered. The most important causal agent for potential cumulative impacts on cultural resources is increased population. The contribution of the alternative to cumulative impacts is minor in the case of only the resources described in the proposal and in the case of all resources in the planning areas leased and developed. The population associated with development of oil and gas resources in the region is assumed to to be enclaved or located in concentrated area.

2) Impacts of Special Concern

a) Commercial and Subsistence Fisheries

(1) Important Fish Resources: The important commercial fishery resources of the Gulf of Alaska include all five species of Pacific salmon, king, Tanner and dungeness crab, shrimp, scallops, Pacific herring, halibut, and several species or groups of bottomfish (ocean perch, blackcod, walleye pollock, Pacific cod, sole, and flounder). Subsistence fisheries tend to rely more heavily on salmon, and to a lesser degree on crab and other shellfish. Impacts to these resources would result from accidental oilspills and discharge of drilling effluents and wastes.

Over the life of the proposal, 0.6 oilspills greater than 1,000 barrels and 0.2 oilspills greater than 10,000 barrels are expected to result from Alternative

I-1 South Alaska sales. For the sake of this planning area's analysis, all the South Alaska sales resource estimates and resultant development are assumed to occur in the Gulf of Alaska. Oilspills can impact fish populations by causing short-term acute impacts or long-term sublethal impacts. Since most oil remains at or near the surface, species that are most vulnerable are those that inhabit the surface layer or shallow nearshore at least some time during their life cycle. These species include salmon (adult and juvenile of all five species, and egg and larvae of pink and chum salmon), herring (all life stages), crab (larvae of all species), shrimp (adult), and several species of demersal fish (eggs and larvae).

Salmon: Adult salmon (of all five species) would be vulnerable to oil contamination if a spill contacted areas in or near the mouths of rivers during or preceeding periods when these fish are congregating near these river mouths prior to migrating up river to spawn. Smolt would be susceptable to adverse impacts in the same areas during out-migration or in nearshore areas during their first few months in the marine environment. Pink and chum salmon would be vulnerable during all life stages as these species spawn intertidally to some degree. Vulnerability to any of the five species would vary depending on the timing of the spawning or out-migration of a particular population or run. The five adult species of salmon in the planning area exhibit a period of vulnerability (spawning period) of approximately three to four weeks. This period of vulnerability occurs from May to September. Little is known about the movements of juvenile salmon. They make coastwide movements (lateral to shore), feed and grow in the intertidal, and move offshore over a period of months.

If it is assumed that an oilspill contacts a nearshore area, especially off the mouth of a salmon stream, several impacts could occur. These impacts could be any of a variety of lethal or sublethal toxic responses, or the loss of fish prey organisms. Adult salmon are highly mobile, and some evidence suggests that this life stage could detect and avoid toxic levels of aromatic hydrocarbons in solution (Weber et al., 1981). Therefore, the major concern seems to be that these adults would avoid areas of contamination, which if found off the mouths of major spawning rivers could result in delays in spawning runs or actual blockage of the river or stream. Given the fact that oilspills in the marine environment generally result in concentrations less than those which have proven toxic to adult salmon (Malins, 1977), it is quite unlikely that this type of impact would occur. Even if toxic concentrations did occur, these concentrations would not remain long in marine waters, especially off the mouth of major rivers where dilution and dispersion would occur rapidly.

Salmon smolt on the other hand would perhaps be more vulnerable, in that they would remain in nearshore waters for longer periods while they feed and grow in preparation for movements farther offshore. However, like adult salmon juveniles appear to possess the ability to detect toxic concentrations of petroleum hydrocarbons (Maynard et al., 1981). If this is the case, then oilspills in the nearshore could possibly be avoided to some degree by this life stage. Additionally, as stated above, toxic concentrations in the range of concern (5-15 parts per million [Maynard et al., 1981] of aromatic hydrocarbons) would not be expected in marine waters. However, considering that a spill could remain several days or several weeks in coastal waters,

portions of a population may be subject to prolonged stress from sublethal effects.

The eggs and larvae of pink and chum salmon that occur in marine intertidal areas would be the most vulnerable of these earlier life stages. It would be difficult to quantify the impacts to a local salmon fishery from oilspill contamination in a spawning or larval rearing area. However, it is possible that a large portion of eggs and larvae could be lost. The gravity of this loss, however, becomes somewhat obscure when one considers that natural mortality of eggs an larvae may be as high as 75 percent for each of these life stages. The difficulty would be in ascertaining what percentage of those lost from oil pollution would have succumbed naturally. It is possible that most of a year class from a local population could be lost. When considering the large annual fluctuations in these species, however, this may not always be significant. Generally, though, the loss of a year class is not a desirable effect. It can significantly reduce later year population levels.

Given the extremely low number of expected spills, and the narrow periods of vulnerability at least for adult and juvenile salmon, it is unlikely that an oilspill would contact important nearshore areas during the period when salmon are present. The level of impact to a local pink or chum population could be high as a result of oil contacting an important spawning and larval rearing intertidal area. Areas of importance in this discussion include the Alsek River intertidal area for chum and Yakutat Bay for pink salmon.

Shellfish: All three species of crab (Tanner, dungeness, and king) have similar life histories in that adults spend the winter months in deep water (150-400 m) and migrate to shallow (6-20 m) waters in the spring and summer to spawn. During this period, the eggs which have been carried by the female since the previous spawning period hatch and become free swimming planktonic larvae.

Distribution of these most sensitive larval forms is generally widespread, and therefore would be the most susceptible to contact by an oilspill. The liklihood of such an interaction then is high at least once during the life of the field. Even in the case of a very large spill (10,000 barrels or greater) in the Gulf of Alaska region, only a small insignificant percentage of crab larvae would be contacted by concentrations of oil (1-10 ppm) that would cause mortality. The level of impact on crab larvae is then expected to be low for regional populations.

Another effect on crab populations may result from oil sinking to the bottom and contacting aggregations of adult or juvenile crab or by contaminating large areas and affecting their food supply. There is greater opportunity for these phenomena in shallower, nearshore waters where adult and juvenile dungeness crab spend lengthy periods. The likelihood of such an event is somewhat less than contact to the larval stages. However, given the broad distribution of crab populations it is likely that, with adult and juvenile crab less vulnerable than larval stages, the level of impact to these life stages on a regional basis is low. Local dungeness crab populations in nearshore waters could, however, suffer at least one short-term decline if their habitat is affected.

Scallops would be more sensitive to oil sinking and becoming entrained in the sediments in which they live. This species would be especially vulnerable in the shallow water (25-75m) in the Eastern Gulf of Alaska from Cape St. Elias to Cape Fairweather. These organisms can accumulate certain hydrocarbons very rapidly and tend to retain these compunds for longer periods even after being placed in a clean environment (Malins, 1977), leaving them susceptible to lethal and a variety of sublethal effects. While it is likely that a portion of scallop habitat will be affected, the level of impact to the regional population would be low.

Shrimp: Five species of andalid shrimp (pink, humpy, coonstripe, and spot) exist in the Gulf of Alaska planning area. Pink shrimp, however, predominate in the catch. All species are known to inhabit the continental shelf of this region out to depths of around 200 meters. Mating occurs in September in coastal shallows with the eggs carried offshore by the females until they hatch the following March and April. Young shrimp are found in these shallow areas and move into deeper water as they grow. This shallow water period is the period of greatest vulnerability for large numbers of both young and adult shrimp to be contacted by an oilspill. Areas of concern include the nearshore zone from Cape Suckling to Sitkagi Bluffs in the eastern Gulf of Alaska. Even though unlikely, a large spill could contact this area and induce a moderate ecological loss to the shrimp stocks in this area.

Herring: Herring are most vulnerable from oilspills as spawning adults, eggs, and larvae, in that these life stages occur almost exclusively in nearshore waters. In May and June herring of this region move into the nearshore areas of Prince William Sound and Southeast Alaska to deposit their eggs on vegetation (kelp and eelgrass) or rocky substrate. Eggs hatch within a month and larvae spend about two months in nearshore waters prior to changing into juveniles and moving offshore.

Because of the low number of expected spills and the fact that both general spawning areas (Prince William Sound and Southeast Alaska) are relatively sheltered, it is very unlikely that herring would be contacted by an oilspill under this alternative.

If an oilspill did contact one of the spawning areas during the spawning or larval rearing period, it is possible that adverse consequences to the local herring population could occur. These consequences could include egg or larval mortalities, contamination of spawning substrate, loss of organisms upon which larval herring feed, and adult mortalities. It is possible that a year class from the impacted area could be lost as a result of this impact. The extent of these losses would depend on many factors, with the size of spill and size of the affected area being the greatest determinants. It is also possible that only a portion of the spawning population, eggs, or larval herring would be affected in a given area. Given that extreme environmental conditions (i.e., shortage of food supply, storms, etc.) cause extremely high egg and larval mortality (as high as 99 percent for larvae and 60 to 90 percent for eggs (Smith, 1976)), the loss attributable to an oilspill could be extremely small. Even in the worst case, however, the loss of a local year class would not represent a significant regional impact to the total herring biomass.

Demersal Fish: Demersal species including halibut would probably be less affected by an oilspill than any other species group. The most vulnerable

species are those which have egg or larval forms that inhabit surface or nearshore waters. Important species in the Gulf of Alaska region which display this characteristic are halibut, ocean perch, English sole, starry flounder, and pollock. Because fish eggs and larvae are relatively sensitive to hydrocarbon contact, and because of the broad distribution of these life stages throughout the region it is likely that the one oilspill would result in a low ecological loss to these species. The level of impact on a regional basis would be low.

Several types of discharges and effluents could be released during OCS oil and gas activities. OCS operating orders prohibit disposal of any waste materials into the ocean that will create conditions which will adversely affect aquatic life. Disposal of waste materials is regulated by the Environmental Protection Agency. Of concern are drilling muds because very little is known about their long-term, chronic impacts. There are indications that these muds could produce elevated trace metal concentrations in marine organisms and interfere with reproduction processes. However, given that only 7 exploratory and 26 productive wells are projected for this alternative, a relatively small amount of effluent material would be discharged, (Section V.D.9.a.1.b.) and a small demersal area would be affected.

Conclusion. Fish and shellfish that occupy surface and nearshore waters during some portion of their life history are expected to suffer low ecological losses. Local impacts on pink and chum salmon, and dungeness crab could be high but these fish and shellfish would recover rapidly. Overall, regional impacts on fish and shellfish would be low.

Cummulative Impacts. If all tracts in the Gulf of Alaska are leased and developed during the life of the proposal, the expected number of oilspills is about 3.9 for spills greater than 1,000 barrels and about 1.7 for spills greater than 10,000 barrels. Tankering of oil from the Port of Valdez would increase the expected number of oilspills by an unknown amount. It is probable that one large spill may follow another, or that spills may occur in subsequent years in the same area. This is especially true of Prince William Sound where the Port of Valdez is located. Therefore, the cumulative impact of these oilspills on fish populations probably would possibly cause moderate ecological losses to fish or shellfish populations that inhabit surface or nearshore waters at least some time during their life cycle (salmon, herring, dungeness crab, tanner crab, sole and flounder).

Fish populations are also stressed by commercial fishing pressure which, combined with the cumulative oilspill impact, could result in a high ecological loss to certain species (primarily pink salmon and herring) unless management action (i.e., area closures) is taken to relieve the harvest pressure. Overall, the expected regional impacts on fish populations due to the cumulative impacts is moderate.

The proposal contributes approximately 2 percent of the oilspills greater than 1,000 barrels, and about one percent of the spills greater than 10,000 barrels, and does not contribute significantly to the other impact agents. When compared to the cumulative OCS-related impacts (tankering and fish harvest pressure), the contribution of the proposal is insignificant. Likewise, the contribution of the proposal to the cumulative impacts when only the resources

described in this alternative are leased (as opposed to total development of OCS resources) is still insignificant.

(2) Commercial Fisheries: The Gulf of Alaska, including Prince William Sound and South East Alaska, comprises one of the most valuable commercial fishing areas in Alaska. In 1979, over 191 million pounds of fish and shellfish worth $129 million to commercial fisherman were landed in this region (Alaska Department of Fish and Game, 1980). This represents one-fifth of the total Alaska landings. For the purpose of this analysis, a high economic impact on any commercial fishing industry results when there is a ten percent or greater economic loss to that industry. A moderate economic impact results when there is an economic loss of less than ten percent, yet having some significance to the industry. A low economic loss results when there is a small economic loss to the industry. It should be remembered however, that the loss to individual fishermen probably will be more serious than the loss to industry.

Impacts on commercial fisheries under the proposal would result largely from competition for labor, ocean space use conflicts, competition for infrastructure services, and reduced catch due to ecological loss (as discussed above). This analysis (except for reduced catch) draws largely from Tobolski et. al, (1981), which provides an analysis of fishing industry impacts in the Bering Sea.

Over the life of the proposal, about 0.6 oilspills greater than 1,000 barrels and 0.2 oilspills greater than 10,000 barrels are expected to result from Alternative I-1. Since fish resources are expected to sustain low ecological losses (see discussions in Section V.D.9.a.2)a), the commercial fishing industry could sustain low economic losses because there would be a loss in potential catch. These potential impacts are expected to be short term in duration, and only occur once during the life of the field given the low number of expected spills.

A large oilspill, especially in the region of the eastern Gulf from Cape Suckling to Cape Fairweather, could impact commercial fishing by causing a disruption in space and time. It is unlikely that commercial fisherman will harvest in the area of an oilspill because 1) their boats and gear may be contaminated, 2) they may be restricted from the contaminated area while clean-up efforts are underway, and 3) direct coating and incorporation of petroleum hydrocarbons can cause tainting of marine organisms, rendering them undesirable or unmarketable. This disruption in fishing would affect the nearshore salmon and shellfish fisheries to a greater degree than the offshore demersal fish fisheries. In the unlikely event that a large oilspill contacted this area during the height of the fishing season (varies by species) a moderate to high impact would result on the local fishery (especially on the salmon fishery). Regional economic impacts, however, would be low.

A big portion of fishery related labor in the region of interest is made up of fishermen whose earnings are lower than may be paid to unskilled workers in the oil and gas industry. This is likely to lead to a high willingness of this labor pool to transfer to OCS employment. However, because the number of jobs to which they would be attracted is limited and because there is a considerable excess in the number of crewmen available for fishing jobs, the impact due to labor competition would be very low.

Ocean space use conflicts consist of loss of and damage to fishing gear, loss of access to fishing grounds, and collisions among vessels. Fishing gear conflicts may result from: oil fouling of gear (as stated above), 2) catching or "hanging" gear (trawl nets or scallop dredges) on obstructions such as pipelines and bulk material inadvertantly discarded by industrial operations, 3) and vessel traffic and seismic operations (trailing long seismic cables) in areas where pot-fishing (crab) and longline fishing (halibut) occur. Secondary economic impacts from gear conflicts occur from fishing time lost while waiting for repair or replacement of gear. This may be especially acute in these remote areas in Alaska where replacement gear must be shipped from distant suppliers and transportation services are limited.

The analysis for the St. George Basin (Tobolski, 1981) which projected the number of gear damage/loss claims that would be submitted as a result of oil and gas development concluded that there would be 5 claims ($90,000 in 1980 dollars) per year intially increasing to 12 claims ($216,000 in 1980 dollars) per year during full development. These results were based on the estimated future fishing effort and the projected number of oil and gas installations (platforms) with claim frequencies established for these parameters from North Sea historical data. Given that the intensity of fishing and OCS development is anticipated to be greater in the St. George Basin than in the Gulf of Alaska, the number of claims should be less. Even if the St. George figures are assumed, this would represent a total economic loss of less than .2 percent to the regional fishermen. However, this would represent a very high loss to individual fishermen.

The emplacement of one platform in the planning area would result in a loss of access of fishing grounds in the amount of 78.5 hectares (considering a 500 meter buffer radius for the platform). This represents an insignificant loss to the fishing industry.

Attempts by domestic fishermen to exploit the hitherto foreign dominated demersal fish resources will introduce new vessel traffic in the planning area. Similarly, the OCS supply and support vessels will bring additional traffic leading to increased chances of vessel collisions. This may be especially true in restricted areas such as the entrances to Prince William Sound and Yakutat Bay. However, the analysis for the St. George Basin (Tobolski, 1981) concluded tha only one collision would be expected in 20 years due to increased OCS vessel traffic. Given that OCS development in the Gulf of Alaska will not be as heavy as St. George, it is safe to assume that one vessel collision would be the upper limit for the life of the proposal for the Gulf of Alaska. Such a collision may render only slight to moderate damage or even a complete loss (sinking) of one or both of the vessels involved. If the latter is the case, especially for a larger vessel (catcher-processor), the impact to the fishing industry could be moderate considering the 20 year life of the field.

The most likely damage, however, would be much less, because most collisions do not involve sinking or major damage. Statistics of casualties in U.S. waters show that the average value lost per vessel involved in a collision is approximately $22,137 (1980 dollars). If a fishing vessel is involved in a collision during the life of the proposal, then the annual loss equivalent would be $1107. The expected level of impact to the fishing industry, therefore, is very low.

Impacts resulting from competition for infrastructure services would vary depending on the location of OCS development. In the eastern Gulf these impacts would most likely occur in the vicinity of Yakutat. In this case competition for these services would not be expected. Rather the development of port and harbor facilities to accomodate the limited needs of the oil and gas industry may serve to benefit the segment of the fishing industry centered in Yakutat. This may result from an increase in moorage space, thus allowing more fishing vessels to use the Yakutat harbor. This will increase the ability of Yakutat to better participate in the developing of domestic bottom fishing fishery in the Gulf of Alaska. If the OCS development is in the western or northern Gulf of Alaska, the Port of Valdez and the Port of Seward may serve to provide the necessary infrastructure services. Both Valdez and Seward would be able to accomodate the small amount of such services, and competition between the two industries would be minimal. The expected level of impact from competition for infrastructure services is expected to be low.

Conclusion. As a result of the proposal, the expected level of impact on the commercial fishing industry in the Gulf of Alaska region is expected to be low. The loss to some individual fishermen, however, could be high.

Cumulative Impacts. As previously noted, the cumulative impacts on fish resources (salmon, herring, crab) in the Gulf of Alaska region, especially in Prince William Sound, would be moderate. This would result from the increased number of expected spills (27 spills greater than 1,000 barrels and 16 spills greater than 10,000 barrels) that result from the tankering of Arctic oil from the Port of Valdez. As a result of this moderate ecological loss the fishing industry would be expected to sustain a moderate economic loss.

Because full development of the Gulf of Alaska OCS would not substantially increase OCS activities, other fishing industry impacts (i.e. competition for infrastructure services, ocean space use conflicts, and competition for labor) would not increase significantly over the impacts of the proposal (as stated above).

The contribution of this alternative to the cumulative case is insignificant. The primary contribution of oilspills would be the tankering of oil from the Port of Valdez. The contribution of this alternative when only the resources described in the alternative are leased, as opposed to the total development of OCS resources, would be insignificant.

b) Endangered Species

Cetaceans: Potential impacts from oil and gas development on endangered cetaceans are similar for all the whale species that occur in southern Alaska waters. The Section 7 consultation process on endangered species occuring in Alaska OCS areas considered the effects of oil and gas exploration and oil and gas development in separate phases. Consultation on oil and gas exploration in the Gulf of Alaska OCS has been completed. Additional consultations will take place prior to production and development activities in the region or as additional sale proposals are developed in the various Southern Alaska planning areas. Based on the biology of the whales that inhabit the Gulf of Alaska, the broad distribution of most species of these whales, the relatively small area involved in currently leased lands (Sales 55 and 60), the very low probability of a major oilspill during exploration (no major spill has occurred from an

exploratory well in U.S. waters), and the anticipated relatively low level of exploration activities, the National Marine Fisheries Service concluded that lease sales and exploration activities associated with these sales were not likely to jeopardize the continued existence of any endangered whales or the habitats of endangered whales in the Gulf of Alaska.

Based on the relative importance of the Gulf of Alaska to major populations of seven endangered whales species as critical feeding habitat and the importance of this area as a migration path for endangered whales migrating to and from the Bering Sea and Arctic Ocean, the sale 100 south Alaska area is rated moderately sensitive for endangered species.

Birds: Endangered avian species, _Falco peregrinus anatum_, _Falco peregrinus tundrius_, and _Branta canadensis leucopareia_, are suspected seasonal entrants to Southern Alaska OCS areas. The endangered peregrine falcon subspecies _P. anatum_ and _P. tundrius_ could possibly overwinter in the Kodiak area but are not known to be present in the central or eastern Gulf of Alaska.

Peregrine falcons could be affected in ways similar to those described for marine and coastal birds. Formal Section 7 consultation was considered unnecessary for these birds in Sales 60 and 55 as impacts from exploration was considered unlikely from exploration.

The Aleutian Canada goose _B. leucopareia_ that nests in the Aleutian Islands may occur in the far western Gulf of Alaska and Shumagin areas during migration periods. They are suspected to occur on the Semidi Islands southwest of Kodiak Island. This species could be affected in ways similar to those described for marine and coastal birds. However, the Sale 60 EIS oilspill risk analysis indicated the probability of oilspills reaching the Semidi Islands (only suspected site of the Canada goose in the Gulf) is very low. Therefore, formal Section 7 consultation for this species was considered unnecessary for Sale 60 or Sale 55 lease areas.

Conclusion. Expected impacts to endangered whales is moderate. The impact to birds would be very low.

Cumulative Impacts. If all areas of the Gulf of Alaska planning area are leased and all resources subsequently are developed over the life of the proposal, the expected number of oil spills is 3.9 spills greater than 1,000 barrels and 1.7 spills greater than 10,000 barrels. An additional unknown quantity of oilspills is expected to result from tankering from Federal OCS lease sales in the Diapir and Cook Inlet planning areas. Additional oil spills may occur from development of State of Alaska territorial waters in Cook Inlet and tankering of oil from Valdez. Additional projects or activities that could contribute to cumulative impacts in the planning area are commercial marine traffic. These total projects or activities could affect endangered whales and birds by oilspills and disturbances, reducing population levels and habitats. The cumulative impacts of these oilspill events, projects, and activities are expected to produce a moderate to high impact to whales in the Gulf of Alaska planning area and a low impact to endangered birds.

In relation to all resources in the planning area leased and developed, the alternative contributes 15 percent of spills greater than 1,000 barrels and 12 percent of spills greater than 10,000 barrels from development in the

planning area. These proportions are greatly overshadowed by expected spills from tankering from other Federal OCS planning areas and State lease sale areas (to an unknown extent). The most important causal agent for potential cumulative impacts on endangered whales and birds is from tankering from other Federal and state lease sales. The contribution of the alternative to cumulative impacts is insignificant for both whales and birds with or without total development of the resources being considered in the cumulative case.

c) Habitats and Resources of Special Concern

Habitats: Large concentrations of marine and coastal birds, and marine mammals such as sea otter, harbor seal, and Stellar sea lion occur at the following locations and could be affected by OCS oil and gas activities: the Copper River Delta, and Yakutat forelands-major feeding and staging areas for migatory waterfowl and shorebirds; Forrester, St. Lazaria Islands in the southwest gulf and Middleton Island in the central gulf major seabird colonies, with colony locations with more than one and a half million birds nesting there; Cape St. Elias, Icy Bay, and Prince William Sound major concentration areas for sea otters, seals, and sea lions in the Gulf of Alaska planning area.

Potential impacts from OCS activies on marine mammals and birds would come primarily from oil pollution and man-made disturbance.

Birds: Avian fauna, expecially marine birds (mainly the alcids and marine waterfowl) are perhaps the most sensitive of all marine organisms to oil pollution. Eggs, chicks, and adults of marine birds have a very high sensitivity to oil pollution. Since many marine birds, such as the alcids, have a very low reproductive rate (one chick per year at most) and a slow maturity rate (average age to reach sexual maturity is about 5 years), recovery from a high adult mortality event (such as contact of large numbers of individuals with an oilspill) could take many years. For example, in coastal areas (such as the Baltic Sea), where oil pollution has been a chronic problem, some populations of pelagic birds and sea ducks have decreased by 90 percent in the past 40 years and show no signs of recovery. Also, auk and guillemot populations have been greatly reduced in the vicinity of shipping routes throughout their southern distribution, with localized extermination in enclosed waters, such as the inner English Channel. There has been little notice of recovery or reestablishment of those species in the latter area in spite of improved ballast treatment and international pollution regulations.

The direct effects of oil on marine birds are well-documented. The initial and most critical effect of oil is the loss of plumage water repellency. Oiling causes feather filaments to clump together, leaving gaps in the outer feathers which then permit down feathers to absorb water. In turn, the oiled bird loses its thermo-insulation and buoyancy. Such loss is very likely to result in death from hypothermia, shock, or drowning. The literature indicate as much as 50 to 90 percent of the birds oiled by a spill may never reach the beaches; instead, they may become soaked and sink to the ocean bottom.

Thus, oiled birds seen on the beach may represent a minor portion of the total birds killed by an oilspill. Birds which are slightly oiled and survive direct oil contact suffer varying degrees of hypothermia, impaired mobility, and other physiological effects which, in addition to indirect effects, may contribute to increased population mortality.

Direct contact of oil on birds usually leads to ingestion of oil while the birds are preening. Oiled birds will instinctively preen their feathers in an attempt to clean them. Oil ingestion is shown to cause various pathological conditions of the kidneys, pancreas, gastrointestinal tract, lungs, and other internal organs. Although oil ingestion alone is apparently sublethal, the physiological stress from intoxication and dehydration are significant contributing factors in the death of oiled birds, especially those whose feathers have been affected.

Another direct effect of oil pollution is the probable decrease in reproduction due to physiological effects of oil ingestion, and perhaps more important, due to the contamination of eggs with oil from the feathers of the parent birds. Reduction of egg laying because of oil ingestion has been reported.

Separate studies indicate oil contamination of eggs significantly increases chick embryo mortality, and decreases nesting success. Very minute quantities of oil (5 microliters) applied to the surface of marine bird eggs caused significant chick embryo mortality under laboratory conditions. Similar chick embryo mortality in gull colonies was observed in field experiments with storm-petrels. Embryo mortality is caused by toxicity of oil rather than blockage of gas exchange. Surface application of even small amounts (20 microliters) of weathered oil reduce egg hatching by 50 percent. Oil contamination of nesting birds during the incubation period could substantially reduce hatching success for one nesting season. Thus, chronic oil pollution leading to frequent minor (but not fatal) contact of adults with oil near nesting colonies could substantially reduce productivity and lead to a possible long term decline in colony populations.

In addition to the effects of direct contact with oil, marine birds could be adversely affected by reduction and contamination of food sources. A sudden, oilspill-related local reduction in major food sources that occurs during a migration stopover period, nesting period, or wintering period could lower reproduction and survival of bird populations that depend on that food source. Marine birds living in oil-polluted environments may accumulate residues of the relatively persistent aromatic components. These accumulated residues could lead to chronic toxicity in birds and adversely affect their physiology, reproduction, and behavior.

Another major potential cause of adverse effects on marine and coastal birds due to OCS activities is man-made disturbance. The most serious interrelated disturbance problems specifically identifiable in the proposed sale area are increased air and boat traffic near important nesting areas. The effects of aircraft, especially helicopter noise and presence, over nesting colonial birds and nesting waterfowl have been documented. Low flying aircraft passing near bird colonies frighten most or all adult birds off their nest, leaving the eggs and young vulnerable to exposure, predation, and accidental displacement from the nest during hurried departures by adult birds. Preliminary evidence has indicated that repeated disturbance could significantly reduce hatching success, fledgling success, and perhaps cause adult abandonment of eggs and young. Other potential disturbance problems associated with OCS development include possible displacement of birds from important feeding and staging areas due to increased air and boat traffic, and disturbance due to locating onshore facilities near coastal nesting areas.

Gull populations have increased substantially in response to coastal development in the Gulf of Alaska. Such species as glaucous and glaucous-winged gulls have adapted to utilizing human refuse from canneries, processing ships, garbage dumps, and sewer outfalls. Development related wastes have apparently increased the carrying capacity of the environment for these gulls to the apparent detriment of other species. Gulls prey readily on other marine bird eggs and young. The availability of human refuse has probably enabled gulls to increase their numbers and sustain themselves when preferred food sources are absent, thereby increasing the pressure on their preferred prey when available during the nesting season. Unless disposal of human refuse associated with coastal development, including OCS development, is strictly controlled, changes in competition and predation between gulls and other marine birds would likely occur. Several species of marine birds, such as murres and kittiwakes, may decline markedly while gull populations accelerate. Because of their association with garbage dumps, sewer outfalls, and municipal water supplies along the coast of Alaska, gull species are potential carriers of human bacterial and parasitic diseases, and could be a serious health problem.

Marine Mammals: Short-Term Direct Oilspill Effects: Most apparent in spill situations is the coating of animals with oil; however, unequivocal evidence for mortality of marine mammals caused by oiling in the wild has not been obtained. Laboratory studies have reported increased thermal conductance of oiled northern fur seal and sea otter pelts, indicating loss of the thermal barrier.

Hair seals and sea lions, whose insulation is provided by a thick layer of blubber, apparently suffer no serious thermal effects (hypothermia) from oiling. However, pelage degradation and subsequent wetting has been shown to have serious thermal consequences for sea otters and northern fur seals. Significant metabolic rate increases in oiled northern fur seals has been reported. The increased maintenance costs following contact with oil, when added to other stresses such as pregnancy, lactation, fasting, molting, food shortages or severe weather, are likely to have a profound effect upon the health of these fur-insulated species. Hair seal pups which have long juvenile pelage and lack a thick subcutaneous fat layer are similarly at risk when contacted by oil. These studies suggest that even light oiling may have marked detrimental effects on the thermoregulatory abilities of sea otters, fur seals, and hair seal pups, while effects on other adult pinnipeds would be slight.

A variety of apparently non-lethal effects of oil-marine mammal contact have been demonstrated or could be expected to occur on the basis of petroleum characteristics. For example, oil irritates sensitive tissues, particularly the eyes. Presumably, occurrence of this effect in the wild would interfere with the foraging ability as well as most other activities. Investigators also found transient kidney and possible liver lesions (but no detectable lung pathology), thought to be associated with inhalation of volatile hydrocarbons. Marine mammals also may ingest potentially toxic oil when exposed to a spill. Intake may be incidental to surface activities, a result of grooming, by eating contaminated food (probably negligible in the short-term), or from coated mothers by nursing pups. Results of experiments suggest that short-term toxicity of ingested oil is negligible. Harp seals fed up to 75 milliliters of crude oil showed no evidence of tissue damage. Apparently this species, and presumably other pinnipeds, are capable of excreting and/or detoxifying

hydrocarbons absorbed during short-term exposure, but the effect of sustained and/or chronic exposure remains unknown.

Nor are behavioral responses of marine mammals to oil well known, including the basic question of whether the animals can detect or would avoid oilspills. Dependence of pinnipeds on a substrate during mating, pupping, nursing and for hauling out may force them into repeated exposure to shoreline accumulations of oil. Since field observations of sea lions suggest that scent is important in recognition of pups by females, it is possible that contact with oil could inhibit such recognition in these and other pinnipeds and lead to abandonment and starvation of young. This could have an especially serious effect for fur seals and sea lions because nursing periods are 3 to 4 and 8 to 11 months, respectively.

Long-Term Oilspill Effects: Since stressors of various types affect natural populations throughout the annual cycle and over longer intervals, it is possible that the additional stress of sustained or chronic exposure of marine mammals to spilled oil could result in greater physiological and behavioral effects than discussed above. The extent to which chronic oil contact would contribute to or alter susceptibility to existing physiological and/or behavioral stresses associated with increased density, increased metabolic demands, habitat degradation, or reduced food availability is not readily predictable, and probably can be assessed only by monitoring under field conditions.

Indirect Oilspill Effects: Principal indirect effects of oil pollution on marine mammals would be those associated with changes in the availability and suitability of food resources. Pollutant levels high enough to cause large scale die-off of prey probably would be very localized. There is more concern with long-term sublethal effects on prey population. Sea otters, which feed on relatively sedentary benthic invertebrates, may be the most likely to exhibit local trophic-related oilspill effects.

It is likely that habitat degradation resulting from frequent contamination would lead to temporary avoidance and possible long-term abandonment by marine mammals. Abandonment of traditional breeding and hauling grounds, foraging areas, and migration routes in favor of less suitable areas could have a severe impact on these populations.

Effects of Noise and Disturbance: Low frequency sound, such as may result from drilling, platform operation, and ship operation, are not likely to be physically destructive. Shock waves associated with seismic air guns would not immediately be harmful to marine mammals although the noise may affect behavior. The potential for impact of noise on marine mammals depends on two major factors: (1) characteristics and transmission of the noise, and (2) behavioral and physiological sensitivity of affected species.

Airborne Noise: Air traffic support of oil and gas activities could have adverse effects on marine mammals which consistently occupy breeding and hauling areas near the proposed sale area. Harbor seals are noted for mass exodus from hauling areas when disturbed by low flying aircraft. Spotted seals reacted "strongly" to aircraft noise, even at considerable distance, by erratically racing across ice floes and diving off. One of the more serious results of such stampedes in harbor seals is the separation of mother-pup

pairs. If separation occurred before mother-pup recognition was firmly established, generally within three weeks of birth, chance of pup survival is greatly reduced, to zero in the case of separation during the first week. Stampedes into the water also can result in injury to the young. Repeated disturbance may lead to abandonment of traditional breeding or hauling areas in favor of less suitable sites.

Underwater Noise: The extent to which pinnipeds use underwater acoustics is not well known, but it would be unusual if it were not used for intraspecific communication and predator avoidance, and possibly food location and spatial orientation, (Noise characteristics and transmission range, auditory capabilities of various species and responses to noise are reviewed in the Draft EIS for proposed Sale 57 USDI, 1981.) Most animals show evidence of habituation to low-level background noise, but this has not been well documented in marine mammals. Speculation exists concerning the potential contribution of chronic industrial noise to physiological stress of marine mammals, and possible interaction with existing stresses on individuals or populations.

In general, habitats and resources of special concern in the Gulf of Alaska planning area are considered comparatively moderate to high in sensitivity to potential OCS oil and gas activities. Species that could be significantly affected by oil pollution are sea otters and diving species of marine birds particularly the alcids. Habitats of special concern for these species include marine waters near Forrester and St. Lazaria Islands for the alcid species and Prince William Sound for sea otter.

Noise and disturbance as a result of increased OCS activities could significantly affect seals and sea lions at their pupping grounds particularly at Cape St. Elias and Icy Bay. Avoidance of these areas by OCS air and boat traffic, however, could minimize this effect.

Conclusion. Marine mammals and birds, and habitats of special concern are expected to be moderately impacted by potential effects of oil and gas exploration and development in the Gulf of Alaska under the proposal.

Cumulative Impacts. In the unlikely event that all resources of the Gulf of Alaska planning area are leased and developed over the life of the proposal, the expected number of oil spills is 3.9 spills greater than 1,000 barrels and 1.7 spills greater than 10,000 barrels from development in the planning area. Additional oilspills are expected to result from tankering from Federal OCS lease sales in the Diapir and Cook Inlet planning areas. An additional unknown number of oil spills could occur from development of State of Alaska territorial waters in Cook Inlet as well as tankering crude from Federal and State activity out of Valdez (from TAPS). Additional projects or activities that could contribute to cumulative impacts in the planning area are commercial fishing and, platforms, pipelines, muds and cuttings activities relating to OCS Lease Sale 55. These total projects or activities could affect birds and mammals by oilspills, disturbance, reducing population levels, and over fishing. The cumulative impacts of these oilspill events, projects, and activities are expected to produce a moderate to high impact to birds and marine mammals in the Gulf of Alaska planning area.

In relation to the case of all resources in the planning area leased and developed, the alternative contributes 15 percent of spills greater than 1,000 barrels and 12 percent of spills greater than 10,000 barrels from development in the planning area. These proportions are greatly overshadowed by tankering from other Federal OCS planning areas and State lease sale areas (to an unknown extent) in the Arctic area. The most important causal agent for potential cumulative impacts on birds is from tankering from other Federal and State lease sales outside the area. The contribution of the alternative to cumulative impacts is minor, both in the case of the development of resources described in the proposal, and in the case of all resources leased and developed in the planning area.

d) Air Quality: A discussion of the primary factors used in assessing onshore air quality impacts which may result from OCS-related activities and the method employed in quantifying the impact on this planning area are described in Section V.A.3 of this document.

As is noted at the beginning of the discussion of impacts from development of hydrocarbon resources in the Gulf of Alaska planning area, all the resources and infrastructure for the South Alaska area were attributed to the Gulf of Alaska for the purpose of analysis. The resources and infrastructure are wholly assigned to each of the four South Alaska areas. Thus, it is estimated that seven exploratory wells will be drilled to identify the resources and 26 development/production wells and one platform to develop the resources under this alternative. It is assumed, for the purpose of analysis, that production from this platform would be 3.3 million barrels of oil and 26.7 billion cubic feet of gas per year. All of the oil and gas will be transported to shore via subsea pipeline. Estimated representative emissions for exploration/development are provided in Table V.D.9.a.2)d)-1. This information is derived from Table V.A.3-1.

Table V.D.9.a.2)d)-1. Estimated Representative Emissions

Activity	Production at Platform (tons per year)				
	Voc	NO_x	TSP	SO_2	CO
Oil/Gas	27	396	-	0.1	150
Barging	None	-	-	-	-

Onshore OCS facilities located within 20 miles from the Gulf of Alaska shoreline are expected to need emission controls. The one platform associated with the development of resources under the proposal may be located within 20 miles of the coast and therefore require emission controls. One new gas processing plant may be required as a result of the proposal; however, as there are no nonattainment areas likely to be influenced by this activity in planning area, the installation and operation of a gas processing plant is not expected to significantly influence the air quality rating of the area.

A low qualitative impact is expected from routine emissions. The area is in attainment for the primary pollutants; however, some effects would occur from both the onshore gas processing factlity and the platform, should it be sited within 20 miles from shore. If it is located beyond 20 miles from shore, the impacts would be very low. If a blowout, oilspill, or fire was to occur near shore, short-term violations of several NAAQs could occur depending on the type and duration of the accident.

Any emission sources which would adversely affect the onshore air quality would be subject to mitigation required by EPA and the State, if located onshore, and DOI, if located on the OCS. ERG (1981) discusses mitigation measures for OCS facilities.

Conclusions. Overall, the level of expected impacts to air quality due to the proposal would be very low to low. The siting of the platform within 20 miles of the coast and the necessity for emission controls on the platform are the determining factors for low.

Cumulative Impacts. It is estimated that a total of 850 million barrels of oil and 5.25 trillion cubic feet of gas exist in the entire South Alaska Federal OCS. In the event that total development of all Federal OCS resources occurs over the life of the proposal, 5 new platforms with 170 wells would be required. It is unlikely that this development would actually occur over the next 30-35 years.

It is also unlikely that all of the development would occur in just one of the four planning areas in the South Alaska region. However, for the purpose of this impact analysis, it is assumed that total development occurs within this planning area. Development of hydrocarbon resources in the Arctic Federal OCS planning areas also contributes to air quality impacts in this planning area as that crude oil (both the most likely case of 1.95 billion barrels of oil and the unlikely case in which all resources in the Arctic areas are developed over the life of the proposal, 3.78 billion barrels of oil) will be transported to Valdez via TAPS and tankered from Valdez to ports beyond Alaska.

The major influencing factors affecting the onshore air quality in the planning area as a result of development would be 1) the number of new wells drilled, 2) the location of new platforms, 3) the timing of activities (both in the Gulf of Alaska and Arctic planning areas), and 4) the local meteorological conditions. The development of this proposal (including the Arctic and Gulf) could contribute to regional cumulative air quality and onshore development (gas processing plants) could contribute to the local cumulative air quality impacts.

Portions of the planning area will be experiencing some non-OCS related population and industrial growth. In most cases, OCS oil and gas activities would be a moderate contributor to this overall growth. Other activities that will generate air emissions incrementally in the Gulf of Alaska are the tankering of Trans-Alaska Pipeline crude oil, prior Gulf OCS sales and the resulting activity, timber harvesting in coastal areas, other commercial vessel traffic and the development of other onshore energy resources. The cumulative impact of this overall growth will increase ambient air pollutant concentrations. If there is a possibility of air quality standards being violated in the future in this planning area, this would occur in Valdez in conjunction with loading and processing of Trans-Alaska Pipeline oil (Eastern Gulf of Alaska FEIS, Sale 55). Overall cumulative regional air quality impacts are expected to be low; local impacts would also be low. Environmental Protection Agency (EPA) rules associated with the Clean Air Act and the DOI air quality rules have provisions to minimize these impacts.

e) Recreation and Tourism

(1) Tourism: In the area near Yakutat OCS impacts could be mostly in the form of disruption of normal tourist activities such as beachcombing and camping. Any disruptive activities would be local and short-term. Once OCS construction activities are past their peak construction and employment periods, normal recreational patterns would return.

The impact of an oilspill on recreation and tourism in the Yakutat area would be limited. The bulk of the spill would impact south of Dry Bay and would miss that part of the shore area which is most heavily devoted to recreational activities. (Refer to OCS Lease Sale 55 FEIS for details on impacts and resources.) Impact as related to the occurrence of oilspills from exploration and development depends on the amount of major shoreline designated or used for recreation, amount of shoreline designated as environmental preservation area, and oilspill factors, such as miles of exposed shoreline as a percentage of the total shorefront, amount of seasonal use, and the cleanup capability available.

Conclusion. Very low impacts are expected to occur to recreation and tourism.

Cumulative Impacts. In the unlikely event that all potential oil and gas resources of the Gulf of Alaska planning area are leased and all resources subsequently are developed over the life of the field, the expected number oilspills is 3.9 spills greater than 1,000 barrels and 1.7 spills greater than 10,000 barrels. An additional unknown quantity of oilspills is expected to result from tankering from Federal OCS lease sale in the Cook Inlet and Kodiak planning areas. An additional unknown number of oil spills could occur from development of State of Alaska territorial waters in Cook Inlet. Additional projects or activities that could contribute to cumulative impacts in the planning area are Valdez tankering (including tankering of Diapir Field crude), gold mining and coal ships. These total projects or activities could effect recreation and tourism by population impacts and, to a minor degree, oilspills. The cumulative impacts of these oilspill events, projects and activities are expected to produce a low impact to recreation and tourism in the Gulf of Alaska planning area.

The most important causal agent for potential cumulative impacts on recreation and tourism is population pressure. The contribution of the alternative to cumulative impacts is minor.

(2) Wilderness Resources: If an enclave style of development occurs, presently undeveloped land would be used to construct needed facilities. The wilderness character of the land upon which these facilities are placed would be destroyed. Total acreage involved would likely be less than 150 acres.

Conclusion. Less than 150 acreas of land which could be considered as wilderness could be developed. This impact on the wilderness character of the entire region would be very low.

Cumulative Impacts. Wilderness resources would not suffer substantial cumulative effects, except in the case of visual diminution (see Visual Resources). OCS Sale 39 in the northern Gulf of Alaska is non-productive and thus offers no potential cumulative onshore wilderness impacts to the coastal wilderness areas near proposed Sale 55. Other OCS sales in lower Cook Inlet (CI and 60, and 46, offshore Kodiak) are entirely too far away geographically

to have any cumulative effects on wilderness resources near the proposed lease area. Likewise, tanker traffic from Valdez is too far from Yakutat to have any cumulative onshore effect on wilderness areas.

(3) Visual Resources: The development scenario described in the proposal (one platform) would result in an insignificant adverse effect of the visual environment. The least of the visual impacts would occur within the area of the Yakutat forelands. Adverse climate, distance, and changes in vegetation would largely eliminate the negative visual impacts of the offshore platforms.

Conclusion. OCS development would have a low impact on the visual environment on a local or regional basis.

Cumulative Impacts. The cumulative effect of an LNG plant and tanker terminal in Monti Bay on visual resources in the coastal area could be substantial over the life of the proposed project. There are no cumulative visual effects due to prior lease sales, Sale 46, 60, CI, and 39, however, and the likelihood of an LNG plant and tanker terminal is low. The rationale for no cumulative visual impacts from either non-development of Sale 39 or potential OCS activities in lower Cook Inlet and Kodiak is that these areas are well over 500 miles away from Yakutat and quite beyond the normal 15 or so miles out to sea that could be seen from the shoreline. Sale 39 has no development potential because no oil was discovered and thus is unlikely to contribute to any onshore facilities development that could have conceivably resulted in a very localized cumulative visual impact. The actual lease area for Sale 39 was quite far northwest and out of visual range from Yakutat. Total development of the resources in the planning area will have no significant visual resource impact.

f) Socioeconomic Factors: The Gulf of Alaska area is one of four OCS planning areas within the large South Alaska region. (The other three are the Cook Inlet the Kodiak and the Shumagin.) Although the probability of the discovery of commercial quantities of petroleum somewhere within the South Alaska region is considered virtually a certainty, no information is presently available concerning the probabilities of commercial discoveries in the individual OCS planning areas within the South Alaska region. There also are no estimates available for the quantitiesof oil and gas expected from discoveries in the individual OCS areas, although estimates have been prepared for the South Alaska region as a whole. Consequently, employment and population impacts have been estimated for the South Alaska region, but not for the component areas.

Within the South Alaska region, the discoveries expected to result from the proposed 5-year leasing program are 130 million barrels of oil and 0.79 trillion cubic feet of natural gas. Most petroleum workers who develop oil and gas resources within the South Alaska region would live in dormitories during work periods and, for the most part, during rest periods would commute to residences in Anchorage. This would be true for petroleum developments in any of the four OCS planning areas within the South Alaska region. The long-term statewide employment impact of petroleum discoveries in the South Alaska region resulting from the proposed 5-year leasing program would probably be about 300 additional jobs, including all direct and indirect employment effects. The corresponding population impact would be about 600 additional permanent

residents of Alaska. Almost all of the resident population impact would probably occur in Anchorage.

Conclusion. Even with a commercial discovery, most of the impacts would occur in the form of 600 additional people in the State, mostly in Anchorage which could handle the increase; the level of expected impacts is low.

Cumulative Impacts. If the entire Gulf of Alaska planning area is developed over the life of the proposal, the total cumulative impacts on resident employment and population in the affected land area (Skagway-Yakutat census division) during the years 1980-2000 could be very high.

Non-OCS economic development possibilities in the Skagway-Yakutat census division include further exploitation of the recreation-tourism potential, additional forestry resource utulaization, and possible development of a large bottomfish industry. In the absence of OCS development, non-OCS development is expected to generate gradual employment and population growth during the period 1980 to 2000. OCS development in planning areas other than the Gulf of Alaska would have no impacts on the Skagway-Yakutat census division.

It is not possible to project employment or population impacts of Gulf of Alaska OCS development with any certainty, due to the lack of petroleum resource estimates specific to the Gulf of Alaska. Conceivably, if a very large part of the total petroleum resources estimated for the South Alaska region were discovered and developed in the Gulf of Alaska, impacts on the Skagway-Yakutat census division could be significant. Overall, considering all projects and proposals which may occur in the area over the next 30 years, cumulative impacts to employment and population are high.

g) Native Subsistence Cultures

The planning area covers a broad expanse of the eastern Gulf of Alaska and the seaward side of the southeastern Alaska archipelago. Despite the large area involved, there are but few native villages involved, most prominent of which is the Tlingit Indian community of Yakutat situated on the eastern Gulf. The only other village that could be affected by the proposal would be the Aleut village of Tatitlek, located near the Port of Valdez in Prince William Sound. Most all the native villages in southeastern Alaska are situated within the archipelago on inland waterways and are unlikely to be affected by leasing in the Gulf of Alaska.

An extensive analysis of impacts on sociocultural systems and subsistence lifeways in Yakutat is contained in the FEIS for OCS Lease Sale 55 (1980) in the eastern Gulf of Alaska. The traditional culture of Yakutat, while altered by a long history of outside contact, still maintains its integrity and is highly valued by its Tlingit inhabitants, as well as by more recent non-native immigrants to the community. The City of Yakutat had a population of 449 in 1980, and a greater area population of about 600, some 75 percent (450 persons) of which were Tlingit Indian people. Tatitlek, populated by Aleuts of Russian Orthodox faith, is much smaller than Yakutat, yet both villages have similar basic orientations of commercial fishing and subsistence lifeways, with the former more highly developed in Yakutat. A corollary segment of potential impacts to subsistence cultures in the planning area exists with the Copper River subsistence dipnet fishery, should salmon migrating through Prince

William Sound or the Copper River Delta itself be affected by OCS-related activities. Direct impacts on the villages from population growth associated with the alternative are unlikely in Tatitlek and potentially controllable in Yakutat. Yakutat has experienced effects from OCS leasing in the past, when a marine service base for offshore operations support was constructed in Yakutat and used in conjunction with exploration in the leased area of OCS Lease Sale 39 (1976) in the northern Gulf of Alaska. The Yakutat airport was used at that time as a transfer point between jet aircraft and helicopter modes of transportation for offshore platform workers. These workers were obliged to remain within the confines of the airport grounds during such transfers, thus mitigating potential effects on local residents from this source. This had been a negotiated policy consciously conceived. It is likely that a similar negotiation process would ensue for locating and controlling potential population growth in Yakutat, since the principal land owners consist of the native village corporation (Yak-Tat-Kwaan, Inc.), the city of Yakutat and the State of Alaska. Permutations of the enclave concept applied to Yakutat were examined in the OCS Lease Sale 55 FEIS. Indirect effects from drawing skilled workers from key jobs in Yakutat could take place, although the impacts should be minimal considering the experience involving an explicit policy of local-hire exercised when the marine service base was in operation in 1976 and subsequent years.

Disruption in the access to, or availability of local marine subsistence resources from the effects of localized oilspill events could have major impacts on village sociocultural systems. The statistically derived mean number of spills equal to, or greater than 1000 barrels, is 0.6 for the planning area. The comparable statistic for spills equal to, or greater than 10,000 barrels is 0.2. Nearshore effects from spills at locations critical to specific marine resources used locally, or within the immediate vicinity of subsistence villages, where beaches, lagoons, and wetlands are intensively used for subsistence resource harvest, could produce direct and indirect impacts on local sociocultural systems. Such direct and indirect consequences at the village level could include restricted hunting and fishing, greater effort in obtaining sufficient replacement resources, and social stress associated with the actual or perceived loss of subsistence resources. The small number of spills expected over the life of the field, and the few villages involved reduces the likelihood of such impacts effecting local villages.

Conclusion. Impacts on native subsistence cultures over the life of the field are expected to be low as a result of the low number of expected spills, the few villages involved, the experience of Yakutat with earlier offshore oil operations, and the growth policy controls existing in Yakutat.

Cumulative Impacts. If all areas of the Gulf of Alaska planning area are leased and all resources subsequently are developed during the life of the proposal, the expected number of oilspills is 3.9 spills greater than 1000 barrels and 1.7 spills greater than 10,000 barrels. In additon to this, additional spills are expected to result from the tankering of crude oil from the Arctic through the Port of Valdez in Prince William Sound. The increased risk of impact as a result of tankering Arctic crude would accentuate the impact on the subsistence village of Tatitlek in Prince William Sound, although the subsistence culture of Tatitlek is presently subject to high risk from the tankering of Prudhoe Bay oil from the Port of Valdez.

Potential impact to the subsistence base of Yakutat could be expected to be much less than for Tatitlek, since the tankering would be far more removed from the coast than would be the case within Prince William Sound.

Oil spills also may take place associated with leases within State waters, but no leases exist presently in the Gulf of Alaska or are planned in the next five years. Other Federal OCS leased lands are present in the Gulf of Alaska as a result of lease sales 39 and 55. Tankering from future OCS lease sales in the Kodiak and Cook Inlet planning areas could add to the potential for spill effects, as could future State offshore lease sales in Cook Inlet (#35,#40, and #49). Such tankering from Kodiak or Cook Inlet should be well offshore coastal communities. The cumulative effects of these oilspills and activities are expected to produce moderate to high impacts to native subsistence cultures in the Gulf of Alaska planning area.

In relation to the case of all resources in the planning area leased and developed, the alternative in the Gulf of Alaska planning area contribute 15 percent of spills greater than 1000 barrels and 12 percent of spills greater than 10,000 barrels. These proportions are substantially overshadowed by the expected spills from tankering of Arctic crude oil from the Port of Valdez. Here the alternative in the Gulf of Alaska contributes 2 percent of 1000 barrels spills and 1 percent of 10,000 barrels spills. The most important causual agent for potential cumulative impact on the Gulf of Alaska is the transhipment of Arctic crude oil through the Port of Valdez. The alternative in the Gulf of Alaska contributes marginally to cumulative impacts in either the case of only the resources described as developed or all resources leased and developed in the planning area.

3) Impacts on Other Management Plans:

Coastal Zone Management: While the ACMP covers the coastal zone statewide, there are no regional plans for the coastal zone adjacent to this area.

Fishery Management Plans: A Gulf of Alaska Plan has been written for all groundfish species.

4) Unavoidable Adverse Impacts: Oilspills, discharges of drilling effluents (muds, cuttings, and formation waters) and sewage disposal would result in unavoidable adverse impacts to water quality unde the proposal. Impacts from all the above except oilspills could be mitigated by EPA NPDES regulation.

Water supply would be unavoidably adversely affected by this proposal. Limited supplies would be consumed by OCS-related infrastructure and development, creating demands on supplies of unknown quanity.

The unavoidable adverse impact for land use would be a reduction in the amount of land available for other uses. Occupation of land by OCS-related activities and structures would be minimal.

Coastal ecosystems would be unavoidably adversely affected by oilspills and various discharges as mentioned above for water quality. The level of impact would be restricted both geographically and temporally.

The proposal would have unavoidable adverse impacts on fish by oilspills contacting nearshore habitats, or on eggs and larvae which occur on or near the surface. Oilspills would also affect commercial fishermen by reducing the number of harvestable fish. These impacts are expected to be minimal.

Birds, marine mammals, and endangered species would also suffer unavoidable adverse impacts from oilspills. The level of impact would depend on when and where the oilspill occured. Regional endangered species consultation with NMFS and FWS is required and would be conducted as needed.

Recreation and tourism resources would be adversely affected unavoidably by damage to visual resources through the intrusion of onshore support infrastructure and road systems, nearshore systems of causeways, pipelines and drilling islands, offshore oil and gas platforms, and vessel and aircraft traffic supporting such operations. Such effects would be localized and may serve as an attraction to a segment of the recreation and tourism population.

Cultural resources offshore, such as housepits, burins, scrapers, arrowheads and other artifacts, would be unavoidably destroyed through OCS operations, but the great dynamics of the marine environment may already have resulted in the destruction of many of these resources. Cultural resources located onshore could be lost or damaged by public pilfering or indiscriminate exposure of artifact sites.

Introduction of urban and industrial land uses, except for regional urban centers, would change the character of isolated, de facto wilderness areas, but impacts would be isolated and small in relation to the total area involved. Where urban centers are involved, land use demands generated by OCS activities could unavoidably produce adverse effects derived from the rate and relative scale of demand. Land speculation and price inflation could be experienced as well as interruptions in community facilities and infrastructure during the period necessary for such aspects of land development to catch up with increased land use demands.

Native subsistence cultures could be adversely affected directly in an unavoidable way through accidental oilspills and an increase in population, causal agents which could affect the access to and availability of subsistence resources. Perhaps more insidious are the indirect adverse effects which could be caused unavoidably by nature of kinship-based social networks existing between regional centers and villages and the periodicity of urban-village migration customary in village regions. Localized effects in villages could have adverse effects throughout the village region. Disruption of customary urban-village migration patterns, through effects such as urban housing shortages, price inflation or reduced supply of public services, could cause hardship for those segments of the population unable or unwilling to adapt to such changes and contribute to social disorder and disorientation of cultural value systems.

5) Relationship Between Local Short-Term Uses of Man's Environment and Maintenance and Enhancement of Long-Term Productivity: The effects of the alternative would vary in kind, intensity, and duration, beginning with preparatory activities (seismic data collection and exploration drilling) of oil and gas development, and ending when natural environmental balances might be restored.

Biological productivity would be lost in the short-term on all onshore lands used in the proposed project. These areas could be returned to productivity in the long-term with proper management. Restoration may not be entirely feasible; however, the overall loss would be a minor adverse effect. The direct land requirements would show in both the short-term and the long-term because of disturbance. Major construction projects would cause definite changes in both the short-term and long-term. Some species may have difficulty repopulating and could be displaced.

Short-term oil pollution and the possibility of long-term cumulative oil pollution impacts could cause serious adverse effects on all components of the marine ecosystem, including fisheries. While restoration would allow fisheries production to regain original levels, any reduced annual harvests during the life of the project would be irretrievably lost. The extent is not known presently, but the potential must be recognized.

The biota would be threatened in the short-term by potential oil pollution. Direct mortality could be significant through the combined effects of harassment by humans and the increased volume and frequency of noise from vessel traffic or overflying aircraft. In the long-term, such disturbances could alter behavior patterns and could drive fauna away from traditional feeding and breeding grounds or to other critical areas within their range, reducing species populations over a long period of time.

Habitat destruction could cause a reduction in subsistence species which could threaten the regional economy. The improved accessibility to primitive areas from increased construction is a short-term result of this alternative. The overall wilderness value of the coast may decrease from increased land use. Increased human populations in the short-term could change the regional native culture in the long-term. The subsistence way of life could be modified and population shifts could occur. The overall changes cannot be termed positive or negative, except by those affected.

Archaeologic and historic values discovered during development would enhance long-term knowledge. Overall, finds may help to locate other sites, but destruction of artifacts would represent long-term losses.

Consumption of offshore oil and gas would be a long-term use of non-renewable resources. Economic, political, and social benefits may accrue from the availability of oil and gas. Most benefits would be short-term and would decrease the nation's dependency on oil imports.

The production of oil and gas from the planning area would provide short-term, critically needed energy, and perhaps, provide time either for the development of long-term alternative energy sources or substitutes for petroleum feedstocks. Petroleum development in these areas may mean the irreplaceable loss of some fisheries production. The maintenance and enhancement of long-term productivity would depend on efforts to control water quality levels. Regional planning would aid in controlling changing economics and populations, and thus, in moderating any adverse impacts.

6) Irreversible and Irretrievable Commitment of Resources:

a) Mineral Resources: Resources discovered would be irretrievably consumed.

b) Biological Resources: Commercial fishery losses may occur principally by oilspills interfering with salmonid migrations or by their direct contact with larval fishes and/or their planktonic food supplies. Any losses of commercial fishing incomes attributable to this alternative would be irreversible and irretrievable to the extent they were uncompensated. Unharvested commercial finfish and shellfish, as renewable resources, would be irretrievably lost to the economy.

Increased air and ship traffic and onshore activites, as well as potential habitat degradation or reduction in available food resulting from oil and gas industry operations could displace birds and mammals into less favorable environments, ultimately resulting in reduced population levels. Displacement could become irretrievable if permanent alterations of the environment were maintained by such activities.

c) Endangered Species: Under the alternative, it is possible that endangered whales could be subjected to irreversible direct and indirect effects of oilspills, disturbance due to noise and other human activities, or losses and/or deterioration of habitat due to facility developments. Whether such effects would lead to permanent (irreversible) losses of whale resources is unknown.

d) Social Systems: Village subsistence practices could be affected irreversibly by the displacement of subsistence resources from locally-used customary habitat or by the reduction of resources through the modification of favorable habitat. The displacement could be irretrievable if the effect were maintained over time. Irreversible changes in cultural values and orientations could occur from the proposal, but the irretrievable nature of these changes to sociocultural systems is unknown.

A high growth situation could cause increased housing costs and shortages and could place extreme demands on utility services such as electrical power, water, sewage, and solid waste disposal. Attempts to provide basic service levels for the above items to meet increased population levels could force communities to forego improvements to the existing services.

Due to the increase in air and marine traffic generated by this alternative and, importantly, the severely inclement weather to which the area is prone, it is highly probable that there would be an increase in transportation related fatalities over the life of the proposal.

e) Economic Systems: The only commitment that could be considered possibly irreversible and irretrievable would be the economic risk, resulting from OCS activity, of destruction of commercial fisheries resources or destruction of other fauna or flora used for subsistence by area residents.

f) Cultural Resources: The destruction of an underwater OCS cultural site would possibly result in an irreversible and irretrievable loss of prehistoric information about human occupancy.

THE MORE SIGNIFICANT ENVIRONMENTAL CONSEQUENCES

Gulf of Alaska

Resource Category	Level of Expected Impacts* Scheduled Sales Only Under Alternative I-1	Cumulative Impacts of All Activities
1. General Impacts		
a. Coastal Ecosystems	low	moderate to high
b. Water Quality and Supply		
Water Quality	low	moderate
Water Supply	high	very high
c. Navigation and Shipping	moderate	moderate
d. Other Uses of the OCS	n/a	n/a
e. Land Use	low	moderate
f. Cultural Resources	low	moderate
2. Impacts of Special Concern		
a. Fish and Commercial Fisheries		
Fish Resources	low	moderate
Commercial Fisheries	low	low
b. Endangered Species		
Cetaceans	moderate	moderate to high
Birds	very low	low
c. Habitats and Resources of Special Concern		
Birds	moderate	moderate to high
Mammals	moderate	moderate to high
d. Air Quality	very low to low	low
e. Recreation and Tourism	very low	low
f. Socioeconomic Factors	low	high
g. Native Subsistence Cultures	low	moderate to high

* Definitions of level of impact are provided at the beginning of Section V.D.

(This table also applies to Alternatives I-2, II, IV-1, and IV-2. See text.)

Yakutat has the only district program near the sale area. Yakutat will receive most of the onshore impact from any gulf sale, and will be able to control and direct any impacts resulting from it. However, with the exception of Yakutat, the adjacent shorelands are in the unorganized borough, i.e., where there is no local government, and consequently no local planning and zone expertise. Local planning carried out under the ACMP would provide a planning framework in these areas.

b. Alternative I-2

Resource estimates and attendant activities, and oilspill probabilities are the same for this alternative as for Alternative I-1. This being the case, impacts resulting from this alternative would be the same as those described for Alternative I-1. In addition, impacts on other management plans and unavoidable adverse impacts would be the same as described for Alternative I-1. The relationship between short-term use of man's environment and long-term productivity for this alternative is the same as that described for Alternative I-1. The irreversible and irretrievable commitment of resources associated with this alternative is the same as described for Alternative I-1.

c. Alternative II

Resource estimates and attendant activities, and oilspill probabilities in the Gulf of Alaska are the same for this alternative as for Alternative I-1. This being the case, impacts resulting from this alternative would be the same as those described for Alternative I-1.

For the cumulative case for this alternative, the number of oilspills associated with tankering of oil through the Gulf of Alaska from other OCS planning areas would be insignificantly different from Alternative Il. The addition of the St. Matthew-Hall area makes no difference since no resource development is expected there. In addition, all other projects and proposals assumed for the cumulative case for Alternative I-1 are also assumed for this alternative. Thus, cumulative impacts for this alternative would be the same as those described for Alternative I-1.

d. Alternative III-1

Discussion of general impacts, impacts of special concern, other management plans, unavoidable adverse impacts, relationship between short-term use of man's environment and long-term productivity, and irreversible and irretrievable commitment of resources is not neccessary as no resources would be leased in the Gulf of Alaska under this alternative. This alternative would cause no impacts.

The only impacts on the gulf would come from other projects and proposals and tankering of oil from other proposed OCS areas. Cumulative impacts would be very similar to those described for Alternative I-1, because the projects considered and the resource amounts estimated to be tankered through the gulf from other OCS areas are insignificantly different than those considered for Alternative I-1.

e. Alternative III-2

THE MORE SIGNIFICANT ENVIRONMENTAL CONSEQUENCES

Gulf of Alaska

Resource Category	Level of Expected Impacts*: Scheduled Sales Only Under Alternative III-1	Cumulative Impacts of All Activities
1. General Impacts		
a. Coastal Ecosystems	n/a**	moderate to high
b. Water Quality and Supply		
Water Quality	n/a**	moderate
Water Supply	n/a**	very high
c. Navigation and Shipping	n/a**	moderate
d. Other Uses of the OCS	n/a	n/a
e. Land Use	n/a**	moderate
f. Cultural Resources	n/a**	moderate
2. Impacts of Special Concern		
a. Fish and Commercial Fisheries		
Fish Resources	n/a**	moderate
Commercial Fisheries	n/a**	low
b. Endangered Species		
Cetaceans	n/a**	moderate to high
Birds	n/a**	low
c. Habitats and Resources of Special Concern		
Birds	n/a**	moderate to high
Mammals	n/a**	moderate to high
d. Air Quality	n/a**	low
e. Recreation and Tourism	n/a**	low
f. Socioeconomic Factors	n/a**	high
g. Native Subsistence Cultures	n/a**	moderate to high

* Definitions of level of impact are provided at the beginning of Section V.D.

** Differs from the proposal.

Discussion of general impacts, impacts of special concern, other management plans, unavoidable adverse impacts, relationship between short-term use of man's environment and long-term productivity, and irreversible and irretrievable commitment of resources is not necessary as no resourcs would be leased in the Gulf of Alaska under this alternative. This alternative would cause no impacts.

The only impacts on the gulf would come from other projects and proposals and tankering of oil from the proposed OCS areas. Cumulative impacts would be very similar to those described for Alternative I-1, because the projects considered and the resource amounts estimated to be tankered through the gulf from other OCS areas are insignificantly different than those considered for Alternative I-1.

f. Alternative IV-1.a

Resource estimates and attendant activities, and oilspill probabilities in the Gulf of Alaska are the same for this alternative as for Alternative I-1. This being the case, impacts resulting from this alternative would be the same as those described for Alternative I-1. For the cumulative case for this alternative, the number of oilspills associated with tankering of oil through the Gulf of Alaska from othe OCS planning areas would be insignificantly different from Alternative I-1. In addition, all other projects assumed for the cumulative impact analysis for Alternative I-1 are the same for this alternative. Thus, cumulative impacts for this alternative would be the same as those described for Alternative I-1. Impacts on other management plans and unavoidable adverse impacts would be the sames as described for Alternative I-1. The relationship between short-term use of man's environment and long-term productivity for this alternative is the same as that described for Alternative I-1. The irreversible and irretrievable commitment of resources associated with this alternative is the same as described for Alternative I-1.

g. Alternative IV-1.b

Resource estimates and attendant activities, and oilspill probabilities for the Gulf of Alaska for this alternative are insignificantly different from those described for Alternative I-1 (and are the same as those described for Alternative IV-1.a.). This being the case, impacts resulting from this alternative would be the same as those described for Alternative I-1. For the cumulative case for this alternative, the number of oilspills associated with tankering of oil through the Gulf of Alaska from other OCS planning areas would be insignificantly different from Alternative I-1. In addition, all other projects assumed for the cumulative impact analysis for Alternative I-1 are the same for this alternative. Thus, cumulative impacts for this alternative would be the same as those described for Alternative I-1. Impacts on other management plans and unavoidable adverse impacts would be the same as described for Alternative I-1. The relationship between short-term use of man's environment and long-term productivity for this alternative is the same as that described for Alternative I-1. The irreversible and irretrievable commitment of resources associated with this alternative is the same as described for Alternative I-1.

h. Alternative IV-2.a.

THE MORE SIGNIFICANT ENVIRONMENTAL CONSEQUENCES

Gulf of Alaska

Resource Category	Level of Expected Impacts* Scheduled Sales Only Under Alternative III-2	Cumulative Impacts of All Activities
1. General Impacts		
a. Coastal Ecosystems	n/a**	moderate to high
b. Water Quality and Supply		
Water Quality	n/a**	moderate
Water Supply	n/a**	very high
c. Navigation and Shipping	n/a**	moderate
d. Other Uses of the OCS	n/a	n/a
e. Land Use	n/a**	moderate
f. Cultural Resources	n/a**	moderate
2. Impacts of Special Concern		
a. Fish and Commercial Fisheries		
Fish Resources	n/a**	moderate
Commercial Fisheries	n/a**	low
b. Endangered Species		
Cetaceans	n/a**	moderate to high
Birds	n/a**	low
c. Habitats and Resources of Special Concern		
Birds	n/a**	moderate to high
Mammals	n/a**	moderate to high
d. Air Quality	n/a**	low
e. Recreation and Tourism	n/a**	low
f. Socioeconomic Factors	n/a**	high
g. Native Subsistence Cultures	n/a**	moderate to high

* Definitions of level of impact are provided at the beginning of Section V.D.

** Differs from the proposal.

Resource estimates and attendant activities, and oilspill probabilities for the Gulf of Alaska for this alternative are insignificantly different from those described for Alternative I-1. Impacts on other management plans and unavoidable adverse impacts would be the same as described for Alternative I-1. For the cumulative case for this alternative, the number of oilspills associated with tankering of oil through the Gulf of Alaska from other OCS planning areas would be insignificantly different from Alternative I-1. Dropping the Arctic sales, particularly the Diapir sale, would result in some lesser amount of oil being transported by tanker through the Gulf of Alaska. The reduction could result in a minimal reduction in the number of tanker spills. Thus, potential cumulative impacts could be reduced slightly with this alternative compared to Alternative I-1. Impacts on other management plans and unavoidable adverse impacts would be the same as described for Alternative I-1. The relationship between short-term use of man's environment and long-term productivity for this alternative is the same as that described for Alternative I-1. The irreversible and irretrievable commitment of resources associated with this alternative is the same as described for Alternative I-1.

i. Alternative IV-2.b.

Resource estimates and attendant activities, and oilspill probabilities for the Gulf of Alaska for this alternative are insignificantly different from those described for Alternative I-1 (and are the same as for Alternative IV-2.a). Thus, impacts resulting from this alternative would be the same as those described for Alternative I-1. For the cumulative case for this alternative, the number of oilspills associated with tankering of oil through the Gulf of Alaska from other OCS planning areas would be insignificantly different from Alternative I-1. Dropping the Arctic sales, particularly the Diapir sale, would result in some lesser amount of oil being transported by tanker through the Gulf of Alaska. This reduction could result in a minimal reduction in the number of tanker spills. Thus, potential cumulative impacts could be reduced slightly with this alternative compared to Alternative I-1. Impacts on other management plans and unavoidable adverse impacts would be the same as described for Alternative I-1. The relationship between short-term use of man's environment and long-term productivity for this alternative is the same as that described for Alternative I-1. The irreversible and irretrievable commitment of resources associated with this alternative is the same as described for Alternative I-1.

ERRATA

Note: The following material was ommitted from the text on the Eastern Gulf of Mexico and should be included between pages 310 and 311

structures in the marine environment. The degree to which offshore oil and gas development will affect recreational fishing is believed to be related to such factors as the number and size of structures erected, the length of time they are in place, and the distance they are from shore. Water depth, oceanic conditions, and bottom type around an offshore platform will also affect the recreational fishing associated with oil and gas structures offshore.

Conclusion Alternative I-1 is likely to have very low to moderate level of impact on recreational resources or activities as a whole in the Eastern Gulf; however, one or two major oil spills are likely to cause significant short term disruption of a few discrete shorefront recreational resources and temporarily displace associated recreational activities. Offshore recreational fishing is likely to increase in the accessible leasing areas where platforms are constructed.

Cumulative Impact In the unlikely event that all tracts offshore the Eastern Gulf are leased and developed during the life of the proposal, the expected number of oil spills is 3.4 spills greater than 1,000 bbl and four spills greater than 10,000 bbl. An additional 16 oil spills greater than 1,000 bbl and 1.8 spills greater than 10,000 bbl are expected to result from tankering of imported crude oil. An unknown number of oil spills could occur from development in State Tidelands. It is unlikely that multiple spills would occur in the same area. The cumulative impact of these spills on recreation is expected to cause a moderate level of local impacts.

About 30 platforms and two pipelines are estimated for this area with all Federal OCS resources developed. Currently there are no platforms on the Federal OCS and no platforms in state waters. An unknown number of structures may occur as a result of resource development in State Tidelands.

Approximately 200 to 400 acres of land will be required with all Federal OCS resources developed. An unknown amount of land could be used to support oil/gas development in State waters. Commercial and residential construction and dredging within coastal areas also could impact recreation. The overall cumulative impact of this construction and ancillary activities is expected to result in a moderate level of impacts on recreation in this region.

The proposal contributes less than 44 percent of oil spills greater than 1,000 bbl; less than 44 percent of oil spills greater than 10,000 bbl; less than 33 percent of the platforms and less than 24 percent of land use. Since the non-OCS-related impacts probably have a greater impact on recreation, the contribution of the proposal to cumulative impacts is low to moderate whether all resources offshore the Eastern Gulf are leased and developed or only the resources described for Alternative I-1 are developed.

f) Impacts on Socioeconomic Factors

The conditional mean estimates of resources recoverable from the Eastern Gulf region as a result of the proposed leasing schedule are .55 billion barrels (bbls) of oil and .71 tcf of natural gas. Based upon the most recent analysis prepared for this area, Sale 67/69 FEIS, peak total employment due to the proposed schedule is expected to be about 6,800 people. About 75 percent of these employees will be locally hired, which will help reduce areawide unemployment. The remaining 25 percent, or about 1,700 people, will represent new resident employment. New resident population in the Eastern Gulf region will be about 3,900 in the peak year as new residents move into the area in response to these additional employment opportunities.

Exploration activity in the Eastern Gulf is expected to require up to 3 temporary service bases, and at least one permanent base. While Port Manatee seems most likely as the site for most service establishments, other possible locations include Pensacola and Panama City, which would primarily serve northwest Florida OCS activity, No platform fabrication yards or refineries are